Transportation Security Administration

Planning Guidelines and Design Standards for Checked Baggage Inspection Systems: Appendices

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ACRONYMS AND ABBREVIATIONS

ADPM	Average Day of the Peak Month
ANSI	American National Standards Institute
APM	Acquisition Program Management
ASCII	American Standard Code Information Interchange
ASP	Advanced Surveillance Program
ATR	Automatic Tag Reader
ATSA	Acceptance Testing and System Assessments
BAM	Bag Allocation Methodology
BDR	Basis of Design Report
BHS	Baggage Handling System
BHSC	Baggage Handling System Contractor
BIS	Baggage Inspection Station
BMA	Baggage Measurement Array
BOE	Basis of Estimate
bph	Bags per Hour
BPT	Baggage Process Timer
BRP	Baggage Removal Point
BSD	Bag Status Display
BSIS	Baggage Screening Investment Study
BST	Baggage Screening Timer
BTT	Bag Travel Time
CAD	Computer-Assisted Design
CBIS	Checked Baggage Inspection Systems
CBRA	Checked Baggage Resolution Area
CCR	CBIS Change Request
CCTV	Closed Circuit Television
CI	Control Interface
CM	Corrective Maintenance
CONOPS	Concept of Operations
CPU	Central Processing Unit
CRPG	Checkpoint Requirements and Planning Guide
CSV	Comma-Separated Values
CWE	Current Working Estimate
DBU	Date of Beneficial Use
DHS	Department of Homeland Security
DSD	Deployment and Sustainment Division
EBSP	Electronic Baggage Screening Program
EDS	Explosive Detection System
ETD	Explosives Trace Detection
FA	False Alarm
FAA	Federal Aviation Administration
FAQs	Frequently Asked Questions
FDRS	Field Data Reporting System
FIFO	First In First Out
FIS	Federal Inspection Service
FSA	Flight Schedule Analysis
FSD	Federal Security Director
GFI	Government Furnished Information
HMI	Human-Machine Interface
HQ	(TSA) Headquarters
HSD	High Speed Diverter
HVAC	Heating, Ventilation, and Air Conditioning
IAT	Independent Acceptance Testing
IATA	International Air Transport Association
ICS	Individual Carrier System
ICS-CERT	Industrial Control Systems Cyber Emergency Response Team
ID	Identifier (or Identification)
ILDT	Integrated Local Design Team
IQT	Image Quality Test
IRD	Interface Requirements Document
ISAT	Integrated Site Acceptance Test
ISO	International Organization for Standardization
IT	Information Technology
LCC	Life Cycle Cost
LCCA	Life-Cycle Cost Analysis
LCS	Life Cycle Support
LEO	Law Enforcement Officer
LIT	Lost in Track
MB	Megabytes
MCP	Motor Control Panel

MCS	Master Control Station
MIT	Mobile Inspection Table
NC	Non-Condensing
NEDS	Networked Explosive Detection Systems
NFPA	National Fire Protection Association
O&M	Operating and Maintenance
OEM	Original Equipment Manufacturer
OIT	Office of Information Technology
OOG	Out-of-Gauge
OS	Oversize
OSARP	On-Screen Alarm Resolution Protocol
OSHA	Occupational Safety and Health Administration
OSR	On-Screen Resolution
OSRA	On-Screen Resolution Area
OTA	Other Transactional Agreement
OTK	Operational Test Kit
OVT	OSR Viewing Time
PDF	Portable Document Format
PDPM	Peak Day of the Peak Month
PE	Photo Eye
PEC	Photoelectric Cell
PGDS	Planning Guidelines and Design Standards
PLC	Programmable Logic Controller
PM	Preventive Maintenance
PVS	Primary Viewing Station
QLR	Quick Look Report
RBS	Risk Based Security
RDC	Regional Deployment Coordinator
RFID	Radio Frequency Identification
RFV	Request for Variance
SAT	Site Acceptance Test
SI	Site Integration
SIDA	Security Identification Display Area
SL	Site Lead
SOP	Standard Operating Procedure
SOW	Scope of Work
SSCP	System Services Control Point
SSI	Sensitive Security Information
STIP	Security Technology Integrated Program
STZ	Security Tracking Zone
SV	Schedule Variance
SVS	Secondary Viewing Station
TAF	Terminal Area Forecast
TIM	Technical Interchange Meeting
TRC	Technical Review Committee
TRN	Test Readiness Notification
TRR	Test Readiness Review
TSA	Transportation Security Administration
TSIF	TSA Security Integration Facility
TSL	Transportation Security Laboratory
TSO	Transportation Security Officer
TSR	Test Summary Report
UIC	Unique Identifier Cell
UPS	Uninterruptible Power Supply
VFD	Variable Frequency Drive
VSU	Vertical Sortation Unit
WLAN	Wireless Local Area Network

APPENDIX A:

SUBMITTAL OUTLINES, FORM TEMPLATES AND EXAMPLES

This appendix provides the following resources to support implementation of guidance and requirements in the PGDS:

- A.1: CBIS Use and Logistics Training Example
- A.2: CBIS Operations Guide – Sample Outline
- A.3: Baggage and Data Flow Chart Examples
- A.4: Daily CBIS Report Examples
- A.5: PGDS Request for Variance Form
- A.6: CBIS Change Request
- A.7: Government Furnished Information Requests
- A.8: Industry Comment Template

A.1 CBIS Use and Logistics Training Example

The following is an example outline for the required documentation for training TSA on the use and logistics of the CBIS.

- Startup and shut down procedures
- Overall bag flow from ticket counter to CBRA
  - Description of bag flow
  - Identify Conveyor subsystems
  - Conveyor subsystem nomenclatures
  - Listing of Photo eye identification numbers correlated to conveyor subsystems
- Bag hygiene for the ticket counter induction and the reinsertion line
- BMA settings
- Fail-safe procedures
- Bag jam clearing procedures including at a minimum:
  - Applicable activation of e-stop controls (this is not a requirement for the actual clearing of the logical fault)
  - Lock out/tag out procedures
  - Removal of articles from the affected jam location
  - Proper reinsertion of the affected articles either upstream or downstream of the jam location, depending on the specific zone (pre-EDS, post-EDS, fail-safe, etc.). In any tracked portion of the EDS, care should be taken to ensure proper bag spacing when placing articles back onto the respective conveyors to ensure bags are not re-inserted into another bag's tracking window.
  - Restart of the affected conveyor subsystem via normal operating protocol
  - Safe personnel maneuvering in and around the jam area
  - Restrict bag jam clearance from an EDS to only authorized TSA personnel or other TSA designees
- E-stop procedures and zones
- CBIS OSR settings
  - List the available travel time for OSR per EDS line
- CBRA Procedures
  - Defining the CBIS BSD Statuses
  - Cross reference of CBIS BSD Statuses to EDS disposition code
  - Bag Removal from the BRP

  - Transfer of Bag Information from BRP to BIS
  - Search for Unknown bags
- CBIS reporting – specifically the Daily EDS reports as outlined in Section 12.13.3
  - How to retrieve
  - How to interpret
- Reintroduction Line procedures
- Appendix
  - Description of operations document for the CBIS
  - Bag handling policy
  - Fail-safe Procedures
  - Jam procedures
- CBIS Interface
- OTK Mode for IQT
- Protocol for coordination aspects between OSR and CBRA
  - The Local TSA will supplement the CBIS training manuals with the following information:
- Train the OSARP refresher course (recommended)
- Provide applicable documented policies and Standard Operating Procedures (SOPs)
  - Correct ETD protocol for Unknown Bags
  - Proper protocol for alarm resolution
- Develop and train OOG procedures (valid vs. invalid)
- Update Staff Allocation Model to ensure proper staffing levels
- Ensure proper inventory of inspection station equipment (i.e. keys, tape, bolt cutter, box cutter)
- Confirm EDS unit location and serial number information for reporting purposes (Performance Management Information System, etc.)
- Specialized Screening – weapons, pets, etc.

A.2 CBIS Operations Guide – Sample Outline

The outline provided follows industry standards.

Title page

- Three letter code of the airport in which the system is located
- Title of Project
- Date of System (based on actual date of beneficial use)
- Project Number (as appropriate)

Fore Matter

- Record of Revisions
- Table of Contents

Chapter 1 - Operational Terms and Definitions

- Chapter Index
- Glossary of operation-related terms and equipment identification/designations
  - Manufacturer codes and abbreviations
  - Operational terminology and abbreviations
  - Symbols
- Other related information, such as
  - Conveyor ID marking rules
  - Equipment information needed for maintenance calls

Chapter 2 - System Overview

- Chapter Index
- System overview – high-level description, diagrams
- Inputs – locations, number of and types of inputs
- Outputs – locations, number of and type of sort areas
- Functional areas and system design

  - Ticket counter
  - Oversize and out-of-gauge processing
  - CBIS and CBRA
  - Sortation system – BMAs, ATRs, manual encoding, makeup
  - Control stations
- System and subsystem conveyor designations
- Processing rate of each subsystem and the total system

Chapter 3 - Baggage Weight and Size Limitations

- Chapter Index
- Normal Size Baggage
- Baggage that can be processed by system but requires special considerations/handling (i.e., skis and golf bags)
- Fragile Baggage
- Oddsize Baggage

Chapter 4 - Detailed Description of System Operation

- Chapter Index
- Detailed operational description for each system and subsystem, with sufficient detail to provide operational personnel such as ticketing agents, service baggage handlers, skycaps, and TSA agents a thorough understanding of how to operate the system, including:
  - System start-up, shut down, operational stop/start control stations, jam reset and emergency stop operational requirements
  - Baggage loading procedures relative to placement of bar coded bag tags
  - System fault annunciation
  - Sortation controllers, computers and workstations
  - All graphic display information systems
  - Specific sortation controller operation
  - Placing equipment "in" or "out" of service
  - ATRs
  - BDDs
  - Hand held bar code scanner guns
  - Bag status displays

  - Creation of flight/sort assignment tables
  - All operator initiated reports
  - All system automatically generated reports
  - All system fault alarm messages and reports
  - Explanation of interaction with system, including:
    - Thorough explanation and purpose of each command message or report
    - Required keyboard or operator response
    - All operator interface command entries
- Operator's troubleshooting guide
- Procedures and recommendations for alternative modes of system operation as may be required due to various equipment or subsystem failures

Chapter 5 - Operational Safety

- Chapter Index
- Safety information related to the proper and safe operation of the specified system and its equipment from an operator's point of view reflecting the most current OSHA, American National Standards Institute (ANSI) and local code, policies and standards and covering at minimum:
  - Pre-operating procedure
  - Start-up and shut-down procedure
  - Emergency stop and restart procedure
  - Jam detection, jam clearance and restart procedure
  - Equipment lockout/tag-out procedures

A.3 Baggage and Data Flow Chart Examples

Figure A.1 through Figure A.3 show generic examples of EDS/BHS/CBRA data flows with no ATR, upstream ATR, and downstream ATR, respectively.

Figure A.1: Detailed EDS/BHS/CBRA Data Flow – No ATR

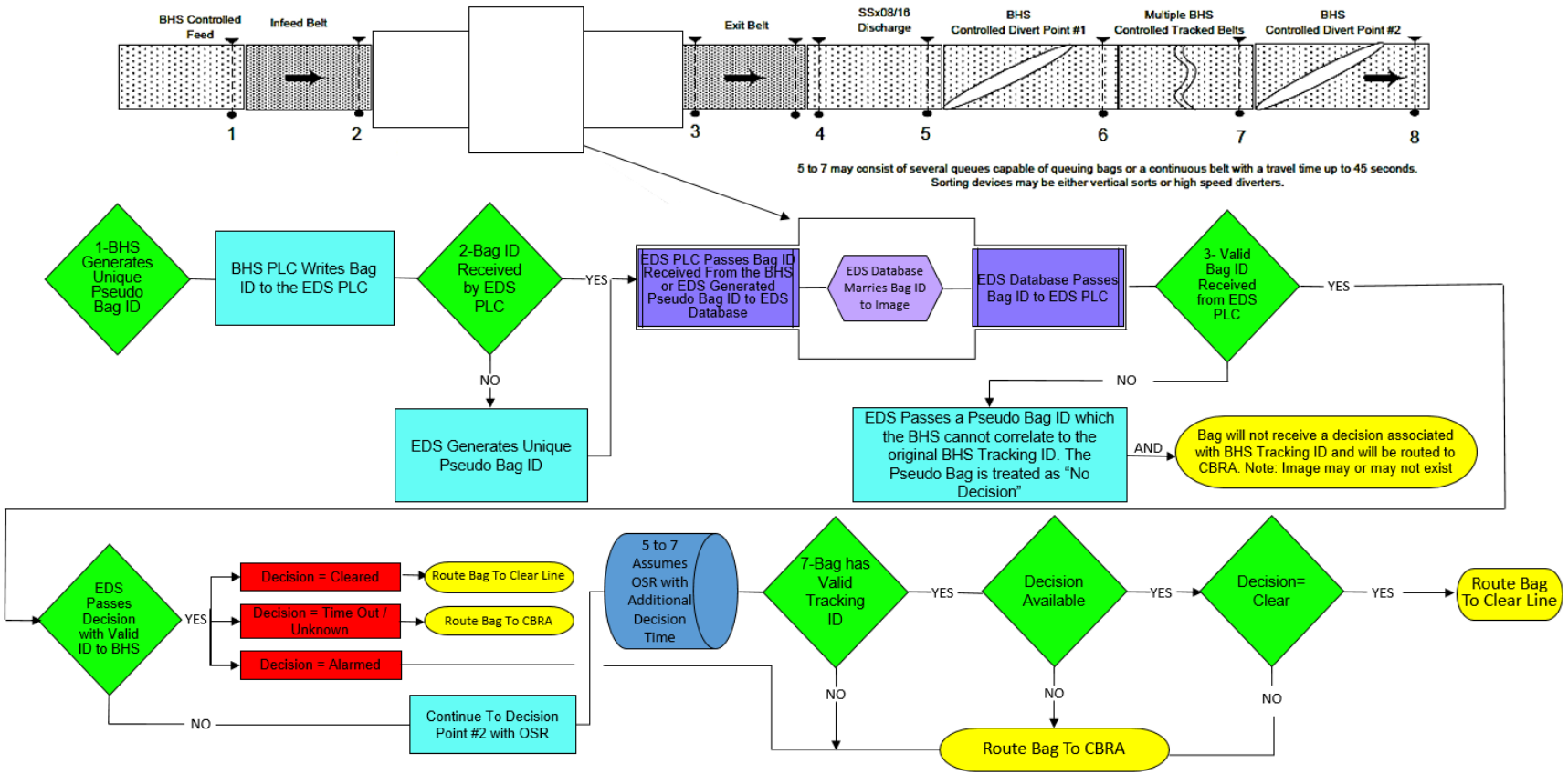


Figure A.2: Detailed EDS/BHS/CBRA Data Flow – Upstream ATR

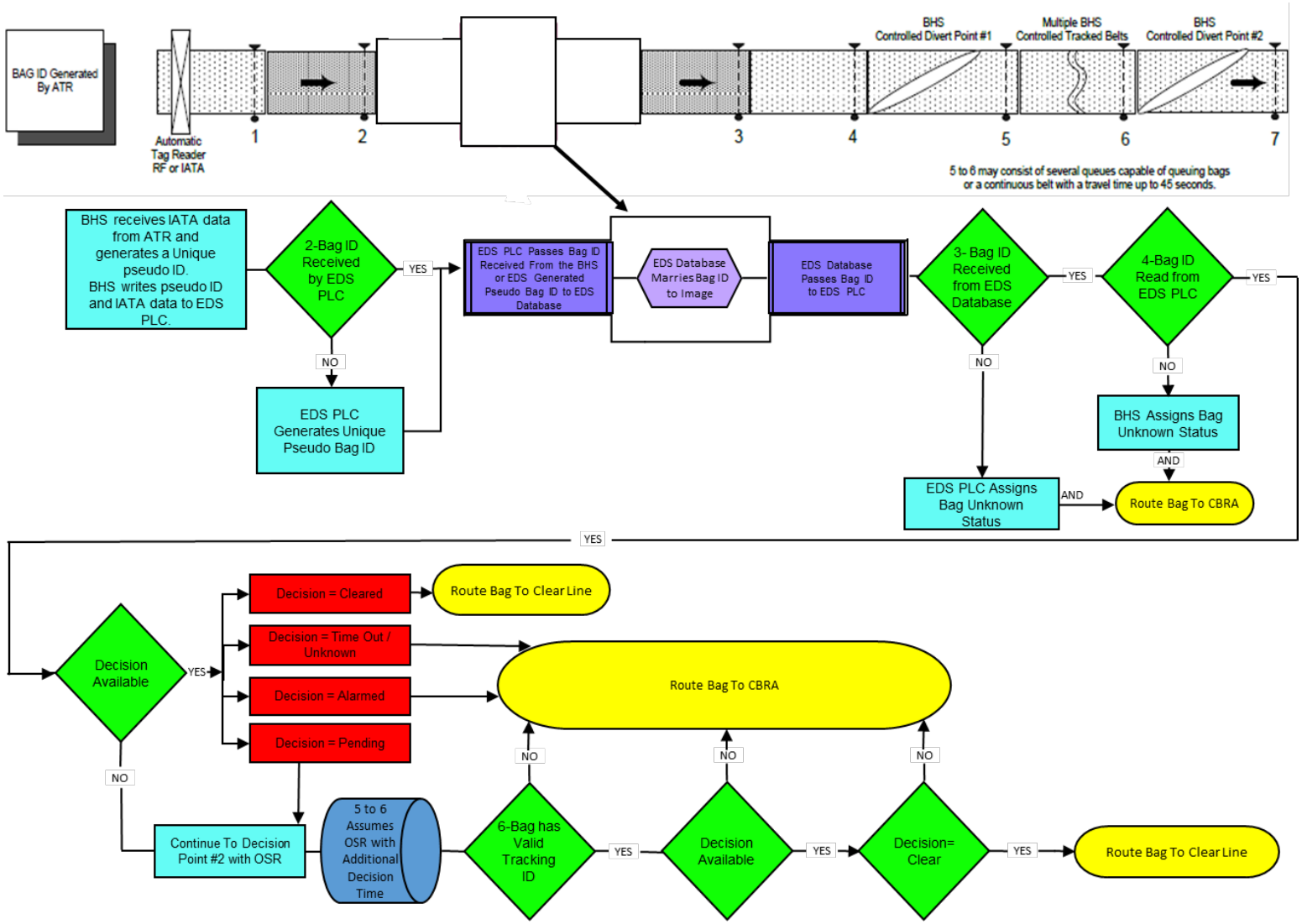


Figure A.3: Detailed EDS/BHS/CBRA Data Flow – Downstream ATR

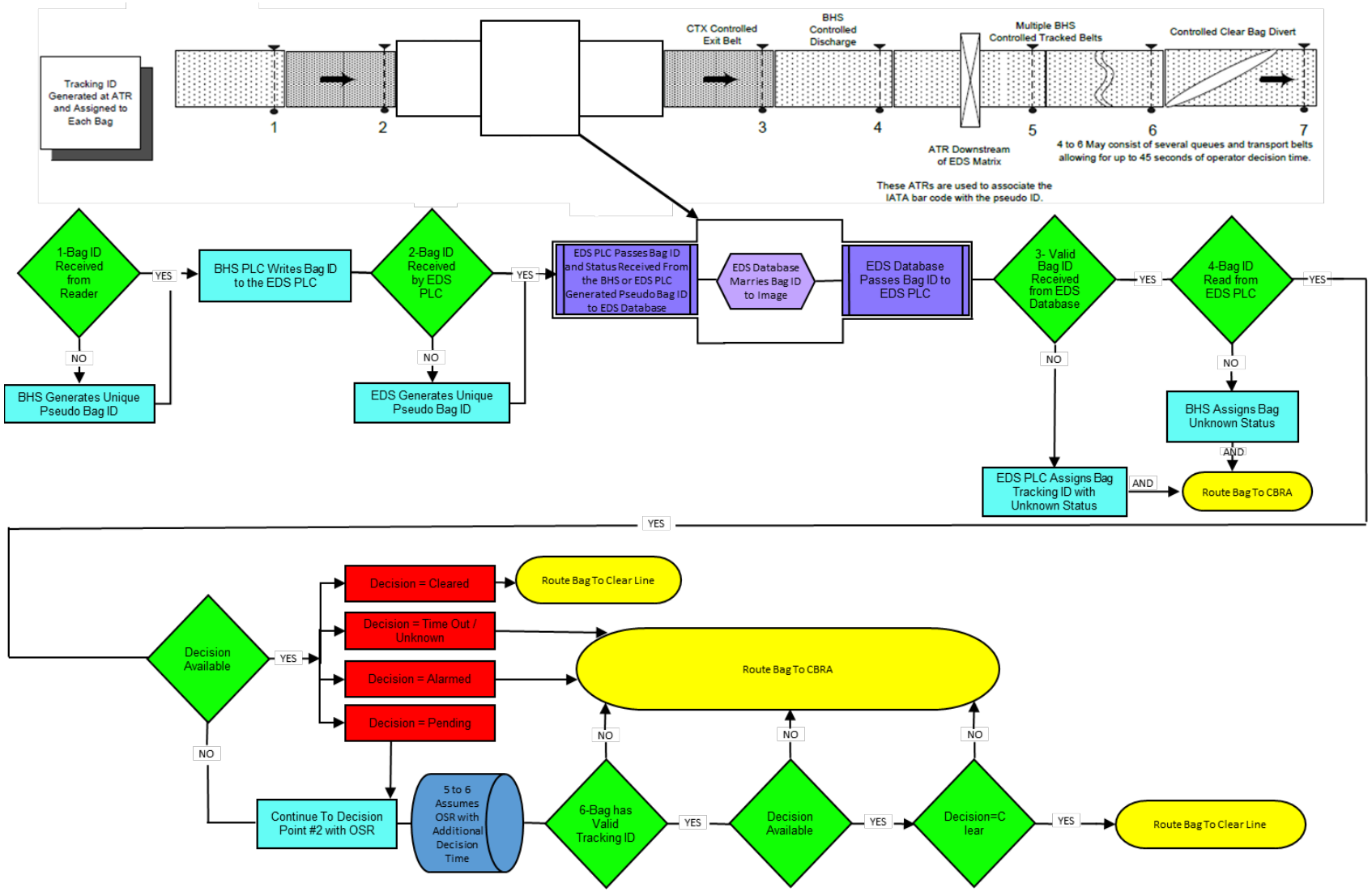


Figure A.4 shows the outbound baggage handling system flow chart for the International Terminal at San Francisco International Airport.

Figure A.4: Outbound BHS, International Terminal, San Francisco International Airport

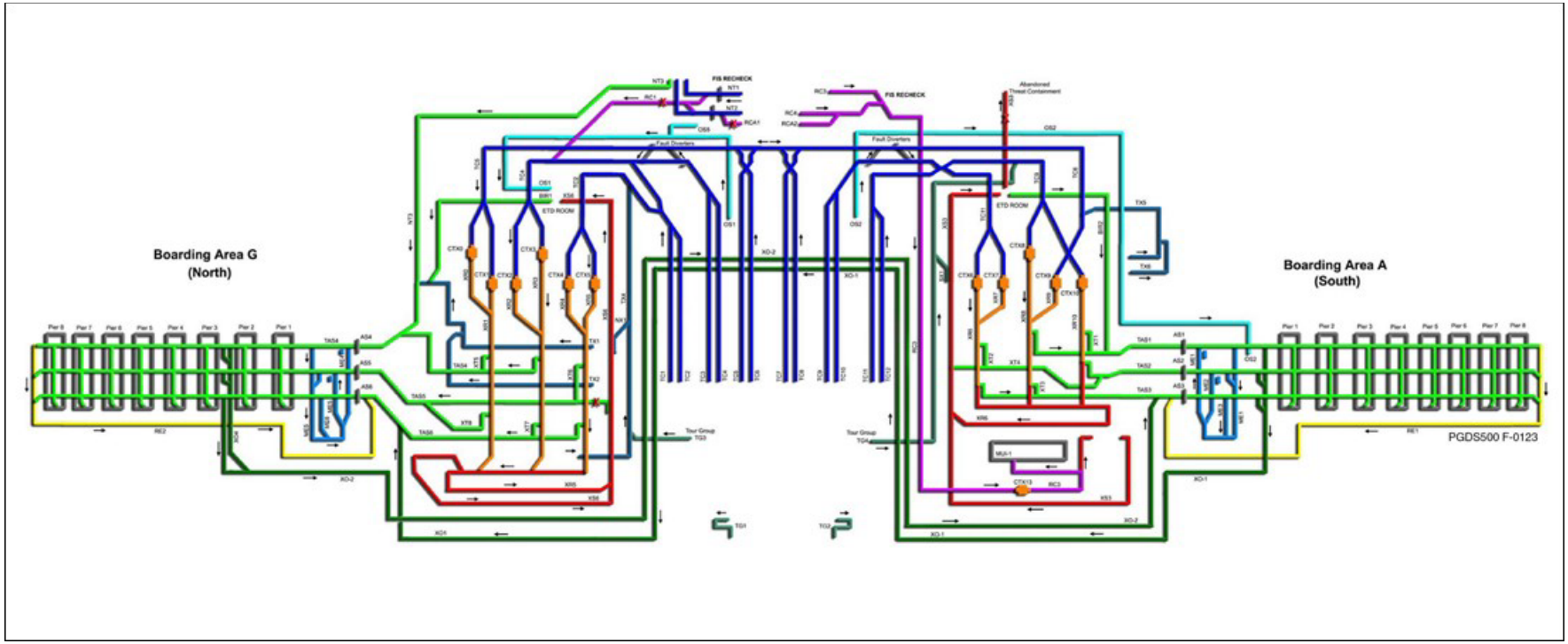
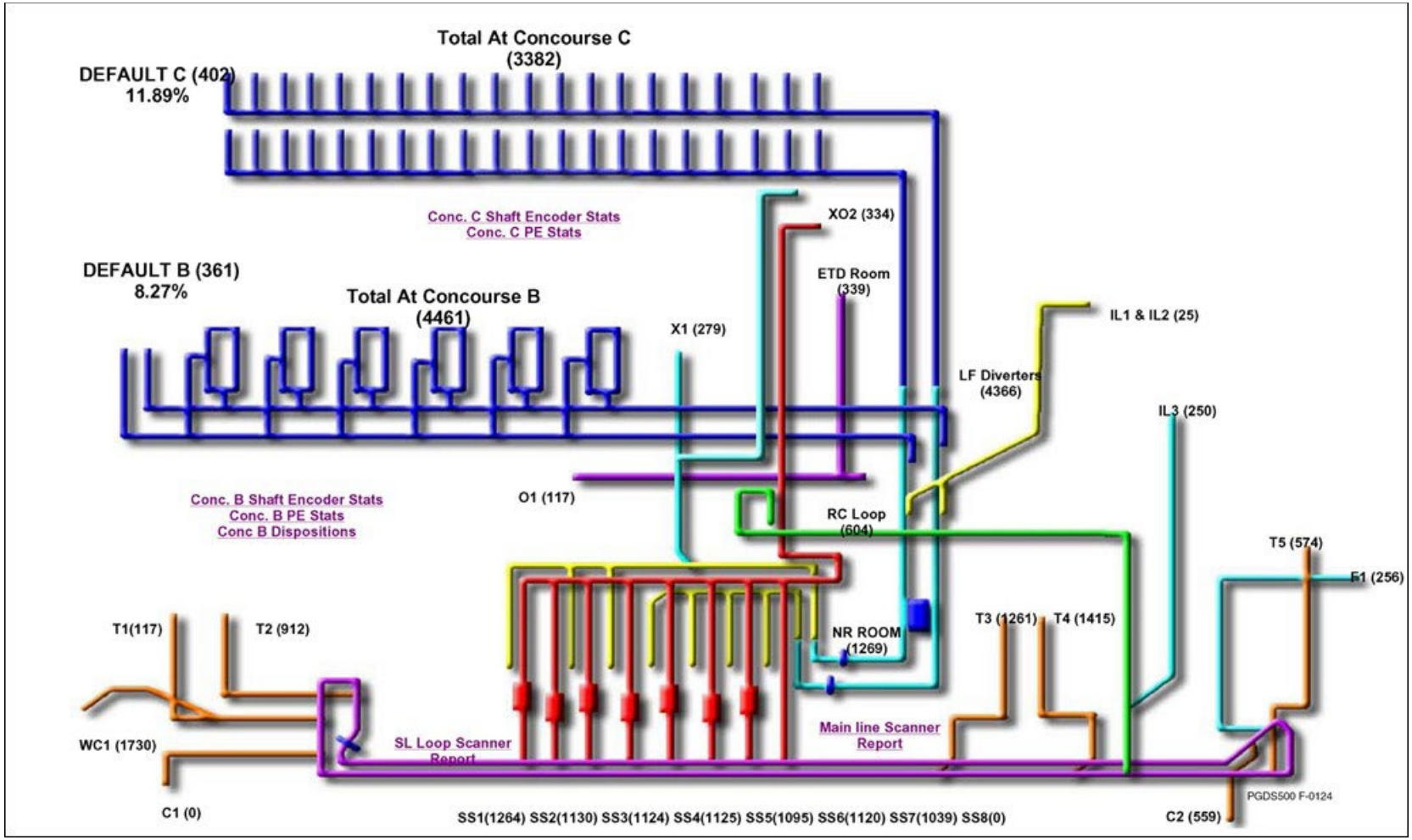


Figure A.5 shows the outbound baggage handling system flow chart for Terminal 8 at John F. Kennedy International Airport.

Figure A.5: Outbound BHS, Terminal 8, John F. Kennedy International Airport



A.4 Daily CBIS Report Examples

The following report examples are intended to provide designers and programmers with formats and the level of detail necessary to meet the reporting requirements stated in Section 12.13.3. Reports that contain SSI will contain appropriate markings.

The Daily CBIS Summary Report – Peak Hour will be identical in layout to the Daily CBIS Summary Report in layout and metrics but the reporting period will be the rolling peak hour of each day.

Reports will include footers containing term definitions and any equations used for metric calculations to provide transparent data interpretation. These definitions and equations may differ from system to system and can depend on how the system is programmed to operate. Note that some figures show example footers with example definitions and calculations for illustrative purposes but are incomplete. Actual report footers will have definitions for each term on the report and all calculations. A separate page may be used if needed.

A.4.1 Daily CBIS Summary Report

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See Section 12.13 for CBIS reporting requirements

Daily CBIS Summary Report

Screening System Name [Name]
Airport [Airport Code]
Terminal [Name]

Report Type	Daily		Report Run Date	[Date]	[Time]
From	[Date]	[Time]			
To	[Date]	[Time]			

Inducted Volume

Inducted Volume	In-Gauge	Out of Gauge	Oversize	Total
Number of Bags	0	0	0	0
Percent of Total	0.0	0.0	0.0	100.0

Time in CBIS	In-Gauge	Out of Gauge	All Bags
Average Bag Time	0:00:00	0:00:00	0:00:00

EDS Volume

	---------- Calculated ----------			------ Measured ------
EDS Volume	Inducted in-Gauge	Reinserted	Total	Counted at EDS
Number of Bags	0	0	0	0
Percent of Total	0.0	0.0	100.0	

Faults and Events

	Number	Total Down Time	Average Down Time
Faults	**0**	**0:00:00**	**0:00:00**
Pre-EDS Lost in Track	0	N/A	N/A
Post-EDS Lost in Track	0	N/A	N/A
Diverter/Door Failure	0	0:00:00	0:00:00
(other)	0	0:00:00	0:00:00
Events	**0**	**0:00:00**	**0:00:00**
Jams	0	0:00:00	0:00:00
E-Stops	0	0:00:00	0:00:00
Fail-Safe	0	0:00:00	0:00:00
(other)	0	0:00:00	0:00:00
Total Faults and Events	**0**	**0:00:00**	**0:00:00**

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Daily CBIS Summary Report Definitions

Screening System Name	[Name]
Airport	[Airport Code]
Terminal	[Name]

Definitions

- **Inducted Volume** = Bags counted at external induction points – ticket counters, curbside, oversize, (excludes reinserted bags); this data matches the corresponding data on the Daily CBIS Bag Volume Report
- **Bag Time in CBIS** = Single bag time from the pre-EDS ATR/BMA to bag delivery onto a clear line
  - Average time is calculated as follows:

$$Average\ Time\ Bag\ in\ CBIS = \frac{\sum_{Total\ Inducted\ Baggage\ Volume} Bag\ Time\ in\ CBIS}{\text{Total Inducted Baggage Volume}}$$

  - If system is not capable of tracking OOG bag time in system, enter N/A in OOG column
- **Reinserted** = Bags counted at RL
- **EDS Volume** = Total Bag Count of bags exiting the EDS machines during report time period; this data matches the corresponding data on the Daily CBIS Bag Volume Report
- **Pre-EDS Lost in Track** is a bag lost between the pre-EDS ATR and the EDS. NO time is associated with this fault.
- **Post-EDS Lost in Track** is a bag lost between the EDS and the last chance divert or CBRA. NO time is associated with this fault.
- A **Diverter/Door Failure** is recorded when a diverter or fire/security door sends any sort of failure signal
- **Other Fault** = to be completed with site-specific faults not already included
- **Jam faults** consist of Hard and Missing bag jams occurring during the specified time period
- An **E-Stop event** is recorded whenever an E-stop button is pressed (this can be further segmented based on e-stop location)
- A **Fail-Safe event** is recorded when the CBIS prevents the conveyance of any non-cleared bag to the clear line
- **Other Event =** to be completed with site-specific events not already included

A.4.2 Daily CBIS Bag Volume Report

Transportation Security Administration

See Section 12.13 for CBIS reporting requirements

Daily CBIS Bag Volume Report

Screening System Name	[Name]
Airport	[Airport Code]
Terminal	[Name]

Report Type	Daily		Report Run Date	[Date]	[Time]
From	[Date]	[Time]			
To	[Date]	[Time]			

1. Inducted Volume		
Input Conveyors	**Number of Bags**	**Percent of Inducted Total**
TC1	0	0.0
TC2 etc.	0	0.0
TC Subtotal	0	0.0
CS1	0	0.0
CS2 etc.	0	0.0
CS Subtotal	0	0.0
TX1	0	0.0
TX2 etc.	0	0.0
TX Subtotal	0	0.0
OS2	0	0.0
OS2 etc.	0	0.0
OS Total	0	0.0
Other	0	0.0
Inducted Total	**0**	**100.0**

2. EDS Volume		
	Number of Bags	**Percent of Total**
Calculated		
Inducted In-Gauge	0	0.0
Reinserted	0	0.0
Total Calculated	**0**	**100.0**
Counted at EDS	**0**	**100.0**

3. Bag Sizing		
	Number of Bags	**Percent of Total**
In-Gauge	0	0.0
Out-of-Gauge	0	0.0
Oversize	0	0.0
Total	**0**	**100.0**

Definitions

- **Inducted Volume** = Bag volume counted at external induction points (excludes reinserted bags) – ticket counters, curbside, transfer, oversize; this data matches the corresponding data on the Daily CBIS Summary Report
- **Reinserted** = Bags counted at RL
- **EDS Volume** = Calculated EDS volume at the BHS PLC should equal bags counted at the EDS exits; this data matches the corresponding data on the Daily CBIS Summary Report
- **Bag Sizing** total should equal Inducted Total; In-Gauge and OOG counted at BMA, OS counted at OS lines

A.4.3 CBIS Executive Summary Report

SENSITIVE SECURITY INFORMATION

Transportation Security Administration

See Section 12.13 for CBIS reporting requirements

CBIS Executive Summary Report

Screening System Name [Name]
Airport [Airport Code]
Terminal [Name]

Report Type Daily
From [Date] [Time]
To [Date] [Time]

Report Run Date [Date] [Time]

EDS Machine	Total Bags	Machine Decisions Total	Cleared	% Cleared	Alarmed	% Alarm	Errors	% Error	OSR Decisions Total	Cleared	% Cleared	Alarmed	% Alarm	Bags tracked to CBRA	Tracking Accuracy %
EDS-SS1	0	0	0	0%	0	0%	0	0%	0	0	0%	0	0%	0	0%
EDS-SS2	0	0	0	0%	0	0%	0	0%	0	0	0%	0	0%	0	0%
EDS-SS3	0	0	0	0%	0	0%	0	0%	0	0	0%	0	0%	0	0%
EDS-SS4	0	0	0	0%	0	0%	0	0%	0	0	0%	0	0%	0	0%
EDS-SS5	0	0	0	0%	0	0%	0	0%	0	0	0%	0	0%	0	0%
Total	0	0	0	0%	0	0%	0	0%	0	0	0%	0	0%	0	0%

Upstream tracking accuracy (%)	Total %
IATA	0.0
OOG (Absolute)	0.0

$$\text{Tracking accuracy} = \frac{\text{Total EDS Alarmed in the CBRA} + \text{Total OSR Alarmed in the CBRA}}{\text{Total EDS Alarmed} + \text{Total OSR Alarmed}}$$

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A.4.4 CBRA Executive Summary Report

SENSITIVE SECURITY INFORMATION

Transportation Security Administration

See Section 12.13 for CBIS reporting requirements

CBRA Executive Summary Report

Screening System Name	[Name]
Airport	[Airport Code]
Terminal	[Name]

Report Type	Daily		Report Run Date	[Date]	[Time]
From	[Date]	[Time]			
To	[Date]	[Time]			

1. CBRA Statistics	Total Bags	% of CBRA Total Volume
CBRA Total Volume	0	100.0
Invalid Arrivals / CBRA Error Rate	0	00.0
Reinserted Bags	0	00.0

2. CBIS Statistics	Total Bags	% of CBIS Volume
EDS Volume	0	00.0
OOG Volume	0	00.0
CBIS Volume (EDS+OOG)	0	100.0
CBRA Total Volume	--	00.0
Invalid Arrivals / Invalid Arrival Rate	--	00.0
Reinserted Bags	--	00.0

3. CBRA Total Volume by Bag Status	Total Bags	% of CBRA Total Volume
Valid Arrivals	**0**	**00.0**
OS	**0**	**00.0**
OOG	**0**	**00.0**
Alarmed	**0**	**00.0**
Alarmed (ALM)	0	00.0
PRE-Alarmed (P-ALM)	0	00.0
SEL-Alarmed (S-ALM)	0	00.0
RBS Clear	**0**	**00.0**
Cleared-PRE (P-CLR)	0	00.0
Cleared-SEL (S-CLR)	0	00.0
Invalid Arrivals	**0**	**00.0**
Timeout	**0**	**00.0**
Queue Time Out (Q-TimeOut)	0	00.0
Operator Time Out (O-TimeOut)	0	00.0
Cleared	**0**	**00.0**
EDS Error	**0**	**00.0**
Unknown	**0**	**00.0**
Lost in Track	0	00.0
Communication Error	0	00.0
Purged	0	00.0
Bag Length Tracking	0	00.0
Following Lost Bag	0	00.0
Too Close	0	00.0
Security Re-route	0	00.0

Definitions

- **CBRA Total Volume** = Total number of bags arriving in CBRA
- **CBRA Error Rate** = Total Invalid Arrivals / CBRA Total Volume
- **Reinserted Bags** are counted at the Reinsert Line
- **EDS Volume** = Total Bag Count of bags exiting the EDS machines during report time period; this data matches the corresponding data on the Daily CBIS Bag Volume Report
- **CBIS Volume** = EDS Volume + OOG (excludes OS)
- **Invalid Arrival Rate** = Total Invalid Arrivals / CBIS Volume

WARNING: This record contains Sensitive Security Information that is controlled under 49 CFR parts 15 and 1520. No part of this record may be disclosed to persons without a "need to know" as defined in 49 CFR parts 15 and 1520, except with the written permission of the Administrator of the Transportation Security Administration, or the Secretary of Transportation. Unauthorized disclosure may result in civil penalty or other action. For U.S. Government agencies, public release is governed by 5 U.S.C. 552 and 49 CFR parts 15 and 1520.

A.4.5 PEC Tracking Report

Transportation Security Administration

See Section 12.13 for CBIS reporting requirements

PEC Tracking Report

Screening System Name	[Name]
Airport	[Airport Code]
Terminal	[Name]

Report Type	Daily		Report Run Date	[Date]	[Time]
From	[Date]	[Time]			
To	[Date]	[Time]			

Photocell	Total Bags	Unknown bags	Missing Bags	Jams	Missing Bag Jams	Purged Bags
PE_AL-01	0	0	0	0	0	0
PE_AL-02	0	0	0	0	0	0
PE_AL-03	0	0	0	0	0	0
PE_AL-04	0	0	0	0	0	0
PE_AL-05	0	0	0	0	0	0
PE_AL-06	0	0	0	0	0	0
PE_AL-07	0	0	0	0	0	0
PE_AL-08	0	0	0	0	0	0
PE_AL-09	0	0	0	0	0	0
PE_AL-10	0	0	0	0	0	0

A.4.6 CBRA Bag Process Timer Report

SENSITIVE SECURITY INFORMATION

Transportation Security Administration

See Section 12.13 for CBIS reporting requirements

CBRA Bag Process Timer Report

Screening System Name	[Name]
Airport	[Airport Code]
Terminal	[Name]

Report Type	Daily	
From	[Date]	[Time]
To	[Date]	[Time]

Report Run Date **[Date]** **[Time]**

	BPT Statistics				BPT Distribution					
Bag Status	**Bag Count**	**% of CBRA Total**	**Average Processing Time**	**Average Screening Time**	**% 0-60 sec**	**% 60-120 sec**	**% 120-180 sec**	**% 180-240 sec**	**% 240 – 300 sec**	**% 300+ sec**
Alarm	0	0.0	00:00:00	00:00:00	0.0	0.0	0.0	0.0	0.0	0.0
Clear	0	0.0	00:00:00	00:00:00	0.0	0.0	0.0	0.0	0.0	0.0
Unknown	0	0.0	00:00:00	00:00:00	0.0	0.0	0.0	0.0	0.0	0.0
Error	0	0.0	00:00:00	00:00:00	0.0	0.0	0.0	0.0	0.0	0.0
OOG	0	0.0	00:00:00	00:00:00	0.0	0.0	0.0	0.0	0.0	0.0
CBRA Total	0	100.0	00:00:00	00:00:00	0.0	0.0	0.0	0.0	0.0	0.0

	BPT Statistics				BPT Distribution					
Station	**Bag Count**	**% of CBRA Total**	**Average Processing Time**	**Average Screening Time**	**% 0-60 sec**	**% 60-120 sec**	**% 120-180 sec**	**% 180-240 sec**	**% 240 – 300 sec**	**% 300+ sec**
1	0	0.0	00:00:00	00:00:00	0.0	0.0	0.0	0.0	0.0	0.0
2	0	0.0	00:00:00	00:00:00	0.0	0.0	0.0	0.0	0.0	0.0
3	0	0.0	00:00:00	00:00:00	0.0	0.0	0.0	0.0	0.0	0.0
4	0	0.0	00:00:00	00:00:00	0.0	0.0	0.0	0.0	0.0	0.0
5	0	0.0	00:00:00	00:00:00	0.0	0.0	0.0	0.0	0.0	0.0
CBRA Total	0	100.0	00:00:00	00:00:00	0.0	0.0	0.0	0.0	0.0	0.0

Definitions

- Processing time starts when bag arrives at assigned BRP
- Screening time starts when TSO starts screening the bag by pressing a button on the BSD
- Timers stop when either Reinsert or Clear button is pressed
- BPT Statistics percentages based on total number of bags in CBRA at BIS
- BPT Distribution percentages based on total number of bags in CBRA for that Bag Type or processed at BIS

WARNING: This record contains Sensitive Security Information that is controlled under 49 CFR parts 15 and 1520. No part of this record may be disclosed to persons without a "need to know" as defined in 49 CFR parts 15 and 1520, except with the written permission of the Administrator of the Transportation Security Administration, or the Secretary of Transportation. Unauthorized disclosure may result in civil penalty or other action. For U.S. Government agencies, public release is governed by 5 U.S.C. 552 and 49 CFR parts 15 and 1520.

A.4.7 CBRA Bag Report

SENSITIVE SECURITY INFORMATION

Transportation Security Administration

See Section 12.13 for CBIS reporting requirements

CBRA Bag Report

Screening System Name	[Name]
Airport	[Airport Code]
Terminal	[Name]

Report Type	Daily		**Report Run Date**	**[Date]**	**[Time]**
From	[Date]	[Time]			
To	[Date]	[Time]			

					Processing Time			Screening Time		
Date	**IATA or Pseudo ID**	**Arrival Bag Status**	**Processed Bag Status**	**Station**	**Start Time**	**End Time**	**Duration (sec)**	**Start Time**	**End Time**	**Duration (sec)**
00/00/0000	1234567890	[Status]	[Status]	[BIS ID]	00:00:00	00:00:00	0	00:00:00	00:00:00	0
00/00/0000	1234567890	[Status]	[Status]	[BIS ID]	00:00:00	00:00:00	0	00:00:00	00:00:00	0
00/00/0000	1234567890	[Status]	[Status]	[BIS ID]	00:00:00	00:00:00	0	00:00:00	00:00:00	0
00/00/0000	1234567890	[Status]	[Status]	[BIS ID]	00:00:00	00:00:00	0	00:00:00	00:00:00	0
00/00/0000	1234567890	[Status]	[Status]	[BIS ID]	00:00:00	00:00:00	0	00:00:00	00:00:00	0
00/00/0000	1234567890	[Status]	[Status]	[BIS ID]	00:00:00	00:00:00	0	00:00:00	00:00:00	0
00/00/0000	1234567890	[Status]	[Status]	[BIS ID]	00:00:00	00:00:00	0	00:00:00	00:00:00	0
00/00/0000	1234567890	[Status]	[Status]	[BIS ID]	00:00:00	00:00:00	0	00:00:00	00:00:00	0
00/00/0000	1234567890	[Status]	[Status]	[BIS ID]	00:00:00	00:00:00	0	00:00:00	00:00:00	0
00/00/0000	1234567890	[Status]	[Status]	[BIS ID]	00:00:00	00:00:00	0	00:00:00	00:00:00	0
00/00/0000	1234567890	[Status]	[Status]	[BIS ID]	00:00:00	00:00:00	0	00:00:00	00:00:00	0
00/00/0000	1234567890	[Status]	[Status]	[BIS ID]	00:00:00	00:00:00	0	00:00:00	00:00:00	0

Definitions

- Processing time starts when bag arrives at assigned BRP
- Screening time starts when TSO starts screening the bag by pressing a button on the BSD
- Timers stop when either Reinsert or Clear button is pressed

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A.4.8 CBIS Hourly Throughput Report

SENSITIVE SECURITY INFORMATION

Transportation Security Administration

See Section 12.13 for CBIS reporting requirements

CBIS Hourly Throughput Report

Screening System Name [Name]
Airport [Airport Code]
Terminal [Name]

Report Type Daily
From [Date] [Time]
To [Date] [Time]

Report Run Date **[Date]** **[Time]**

	Hour	00:00-0:59	0100-0159	0200-0259	0300-0359	0400-0459	0500-0559	0600-0659	0700-0759	0800-0859	0900-0959	1000-1059	1100-1159
AM	EDS Volume	0	0	0	0	0	0	0	0	0	0	0	0
	Alarms	0	0	0	0	0	0	0	0	0	0	0	0
	To CBRA	0	0	0	0	0	0	0	0	0	0	0	0
	Invalids	0	0	0	0	0	0	0	0	0	0	0	0
	Hour	**1200-1259**	**1300-1359**	**1400-1459**	**1500-1559**	**1600-1659**	**1700-1759**	**1800-1859**	**1900-1959**	**2000-2059**	**2100-2159**	**2200-2259**	**2300-2359**
PM	EDS Volume	0	0	0	0	0	0	0	0	0	0	0	0
	Alarms	0	0	0	0	0	0	0	0	0	0	0	0
	To CBRA	0	0	0	0	0	0	0	0	0	0	0	0
	Invalids	0	0	0	0	0	0	0	0	0	0	0	0

CBIS Capacity Utilization (% of Non-Redundant EDS Rate)									
EDS Count/Throughput		75+% Utilization-XXX BPH		85+% Utilization-XXX BPH		95+% Utilization-XXX BPH		100+% Utilization-XXX BPH	
Non-Redundant EDS Count	Total Non-Redundant EDS Throughput Capacity	Number of Occurrences 5-Min Peak Demand is >= 75% and <85%	Total Minutes at 75%-85% Utilization	Number of Occurrences 5-Min Peak Demand is >= 95% and <95%	Total Minutes at 85%-95% Utilization	Number of Occurrences 5-Min Peak Demand is >= 95% and <100%	Total Minutes at 95%-100% Utilization	Number of Occurrences 5 Min Peak Demand is >= 95% and <100%	Total Minutes Above 100% Utilization

Definitions

- **EDS Volume** = Total Bag Count of bags exiting the EDS machines during report time period; this data matches the corresponding data on the Daily CBIS Bag Volume Report
- **Alarms** = Total number of bags that receive a Level 1 alarmed decision
- **To CBRA** = Total number of bags entering CBRA
- **Invalids** = Any bag arriving at a BIS with a status other than Alarmed, OOG, OS, or SEL_CLEAR
- **Total Non-Redundant EDS Throughput Capacity** = Sum of throughput capacity of all non-redundant EDS units in the CBIS
- **XXX BPH** = Percent Utilization for category times Total Non-Redundant EDS Throughput Capacity

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A.4.9 CBIS Bag Spacing Report

Transportation Security Administration

See Section 12.13 for CBIS reporting requirements

CBIS Bag Spacing Report

Screening System Name [Name]
Airport [Airport Code]
Terminal [Name]

Report Type Daily
From [Date] [Time]
To [Date] [Time]

Report Run Date **[Date]** **[Time]**

Start Time	Start Date	End Time	End Date	Equipment	Time Interval (minutes)	Total Bags	Bags Per Hour	Max Bag Length	Min Bag Length	Avg Bag Length	Max Bag Spacing	Min Bag Spacing	Avg Bag Spacing
00:00:00	00/00/00	00:00:00	00/00/00	EDS_ST2	5	0	0	00.00	00.00	00.00	00.00	00.00	00.00
00:00:00	00/00/00	00:00:00	00/00/00	EDS_ST2	10	0	0	00.00	00.00	00.00	00.00	00.00	00.00
00:00:00	00/00/00	00:00:00	00/00/00	EDS_ST2	15	0	0	00.00	00.00	00.00	00.00	00.00	00.00
00:00:00	00/00/00	00:00:00	00/00/00	EDS_ST2	30	0	0	00.00	00.00	00.00	00.00	00.00	00.00
00:00:00	00/00/00	00:00:00	00/00/00	EDS_ST2	60	0	0	00.00	00.00	00.00	00.00	00.00	00.00
00:00:00	00/00/00	00:00:00	00/00/00	EDS_ST2	1440	0	0	00.00	00.00	00.00	00.00	00.00	00.00
00:00:00	00/00/00	00:00:00	00/00/00	EDS_ST3	5	0	0	00.00	00.00	00.00	00.00	00.00	00.00
00:00:00	00/00/00	00:00:00	00/00/00	EDS_ST3	10	0	0	00.00	00.00	00.00	00.00	00.00	00.00
00:00:00	00/00/00	00:00:00	00/00/00	EDS_ST3	15	0	0	00.00	00.00	00.00	00.00	00.00	00.00
00:00:00	00/00/00	00:00:00	00/00/00	EDS_ST3	30	0	0	00.00	00.00	00.00	00.00	00.00	00.00
00:00:00	00/00/00	00:00:00	00/00/00	EDS_ST3	60	0	0	00.00	00.00	00.00	00.00	00.00	00.00
00:00:00	00/00/00	00:00:00	00/00/00	EDS_ST3	1440	0	0	00.00	00.00	00.00	00.00	00.00	00.00

Definitions

- Max Bag Spacing is 36 inches
- Bag spacing of greater than 36 inches is not included in the average bag spacing calculation
- Bags Per Hour is an extrapolated value based on the time interval selected

A.4.10 CBIS Performance Report

Transportation Security Administration

See Section 12.13 for CBIS reporting requirements

CBIS Performance Report

Screening System Name	[Name]
Airport	[Airport Code]
Terminal	[Name]
Report Run Date	**[Date] [Time]**

Report Type	Daily	
From	[Date]	[Time]
To	[Date]	[Time]

1. BAG VOLUME	# Bags	% Total
Total	0	100.0
TC1	0	0.0
TC2 etc.	0	0.0
CS1	0	0.0
CS2 etc.	0	0.0
TX1	0	0.0
TX2 etc.	0	0.0
OS2	0	0.0
OS2 etc.	0	0.0
Other	0	0.0

2. OSR STATS		
Total OSR Bags	# Cleared	% Cleared
0	0	00.0

3. ATR STATS	# Bags	% Total
ATR Total	0	100.0
ATR No Read	0	0.0
Tag Conflict	0	0.0

4. PEAK HOUR	# Bags	% Total
Peak Hour Total	0	0.0
EDS Volume	0	0.0
EDS Alarmed	0	0.0
CBRA Arrivals	0	0.0
CBRA Invalids	0	0.0
Avg Bag Spacing	0	inches

5. EDS STATISTICS	Volume		Alarms		IATA Handoffs	
	# Bags	% EDS Total	# Bags	% EDS Total	# at Exit	% Accuracy
EDS Total	0	100.0	0	0.0	0	0.0
[EDS ID]	0	0.0	0	0.0	0	0.0
[EDS ID]	0	0.0	0	0.0	0	0.0
[EDS ID]	0	0.0	0	0.0	0	0.0
[EDS ID]	0	0.0	0	0.0	0	0.0
[EDS ID]	0	0.0	0	0.0	0	0.0
[EDS ID]	0	0.0	0	0.0	0	0.0

6. TOP 5 PE STATISTICS							
PE Pre-EDS	# Bags	# Unk	% Unk	PE Post-EDS	# Bags	# Unk	% Unk
[PE ID]	0	0	0.0	[PE ID]	0	0	0.0
[PE ID]	0	0	0.0	[PE ID]	0	0	0.0
[PE ID]	0	0	0.0	[PE ID]	0	0	0.0

7. TOP 3 CBIS JAM STATISTICS		
CBIS Jams	Count	Duration
[Location ID]	0	00:00:00
[Location ID]	0	00:00:00
[Location ID]	0	00:00:00

8. TOP 3 FAIL-SAFE EVENT STATISTICS		
CBIS Fail Safe	Count	Duration
[Location ID]	0	00:00:00
[Location ID]	0	00:00:00
[Location ID]	0	00:00:00

9. CBRA STATISTICS	Volume		Reconciled		Reinserted		Peak Hour	
	# Bags	% Total	# Bags	% Total	# Bags	% Total	# Bags	% Total
CBRA Total	0	100.0	0	0.0	0	0.0	0	0.0
Valid	0	0.0	0	0.0	0	0.0	0	0.0
Alarmed	0	0.0	0	0.0	0	0.0	0	0.0
OOG	0	0.0	0	0.0	0	0.0	0	0.0
OS	0	0.0	0	0.0	0	0.0	0	0.0
Cleared-SEL	0	0.0	0	0.0	0	0.0	0	0.0
Invalid	0	0.0	0	0.0	0	0.0	0	0.0
Clear	0	0.0	0	0.0	0	0.0	0	0.0
EDS Error	0	0.0	0	0.0	0	0.0	0	0.0
Comm Error	0	0.0	0	0.0	0	0.0	0	0.0
Unknown	0	0.0	0	0.0	0	0.0	0	0.0
Timeout	0	0.0	0	0.0	0	0.0	0	0.0

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Transportation Security Administration

CBIS Performance Report Definitions

Screening System Name	[Name]
Airport	[Airport Code]
Terminal	[Name]

Definitions

1. Bag Volume: from Daily CBIS Bag Volume report
   - **Inducted Volume** = Bag volume counted at external induction points (excludes reinserted bags) – ticket counters, curbside, transfer, oversize; this data matches the corresponding data on the Daily CBIS Summary Report
   - **CBIS Volume** = EDS Volume + OOG + Reinserted, counts bag trips through the CBIS on the standard conveyors
2. OSR Stats
   - **OSR Total** = Number of bags that receive a Level 2 cleared decision
3. ATR Stats
   - **ATR Total** = count of ATR read attempts
   - Individual percentages are calculated against the ATR TOTAL number
4. Peak Hour: from CBIS Tracking Summary report
   - **Average Bag Spacing** from CBIS Bag Spacing Report
5. EDS Statistics
   - **EDS Total** = Number of bags entering all EDS (measured at the handoff PE)
   - **EDS AL** = Number of bags that receive a Level 1 alarm decision (if a Level 1 decision is not provided by the EDS, leave this section blank)
   - **Tracking** = Total Level 2 alarm bags arriving in CBRA / total Level 2 alarm bags
   - **IATA Handoffs** = Number of IATA IDs received at the exit of the EDS. Accuracy is # handoffs/EDS Total
6. Top 5 PE Statistics
   - These are the 5 photo eyes with the highest percentage of unknown bags for the query selected. These will vary per query.
   - **% Unk** = # Unk / # Bags for each photo eye
   - Photo eyes within the EDS are included in the post-EDS column
7. Top 3 CBIS Jam Statistics: from Daily CBIS Summary report
   - These are the 5 locations with the highest number of jams for the query selected. These will vary per query.
8. Top 3 Fail-Safe Event Statistics: from Daily CBIS Summary report
   - These are the 3 locations with the highest number of Fail-Safes for the query selected. These will vary per query.
9. CBRA Statistics: from CBRA Executive Summary report
   - **CBRA Total** = Number of bags entering CBRA
   - **Timeout** – This is a subset of alarm bags arriving in CBRA
   - **CBRA Invalids** – This total includes the following status and sub-status: Clear, EDS Error, Unknown, Com Error, AND Timeout. The percentage is calculated against total CBRA Total Volume.
   - **Peak Hour Section** – Only populated on reports with durations less than 24 hours or same day

A.5 PGDS Request for Variance Form

RFVs are submitted to TSA Planning branch at CBTPlanning@tsa.dhs.gov. Figure A.6 contains a PGDS Request for Variance Form.

Figure A.6: Request for PGDS Variance Template

Transportation Security Administration

PGDS Request For Variance

The PGDS Request for Variance (PRFV) form is used by the CBIS ILDT to request a variance from the requirements set forth in the PGDS. The RFV is used prior to TSA's Acceptance Testing, and should be submitted to the TSA Project Coordinator for review and acceptance.

(If a response or additional information is requested from the TSA and not received within 48 hours the RFV will be returned as rejected due to insufficient information)

RFV #:
SUBJECT:

FROM:
ADDRESS:

TO: TSA Project Coordinator
ADDRESS:

PGDS REFERENCE:
MOA/LOI/OTA NO.:
ATTACHED DWGs: Yes ☐ No ☐
DWG LISTING:

AIRPORT CODE:
CB PROJECT NO:
DOCUMENTS ATTACHED: Yes ☐ No ☐
DOCUMENTS LISTING:

REQUESTED VARIANCE:

PROPOSED ALTERNATIVE METHOD FOR MEETING PGDS COMPLIANCE:

REQUESTOR:
PRINT NAME:

DATE REQUEST SUBMITTED:

SIGNATURE:

TSA RESPONSE TO VARIANCE:

RFV #:

Preliminary Disposition - Engineering: Accepted ☐ Rejected ☐

Final Disposition – DLD/CBTD: Accepted ☐ Rejected ☐

PRINT NAME: _____ **DATE RESPONSED:** _____
SIGNATURE: _____

Cc:

CBIS_RFV_R07 1

A.6 CBIS Change Request

A.6.1 Change Request Parameters

A change request can be submitted for the following changes:

- Mechanical and electrical drawings
- PLC program pre-change
- PLC program post-change
- Configuration management process
- Testing procedures
- Mitigation/recovery/contingency plan
- Schedule
- Expected results

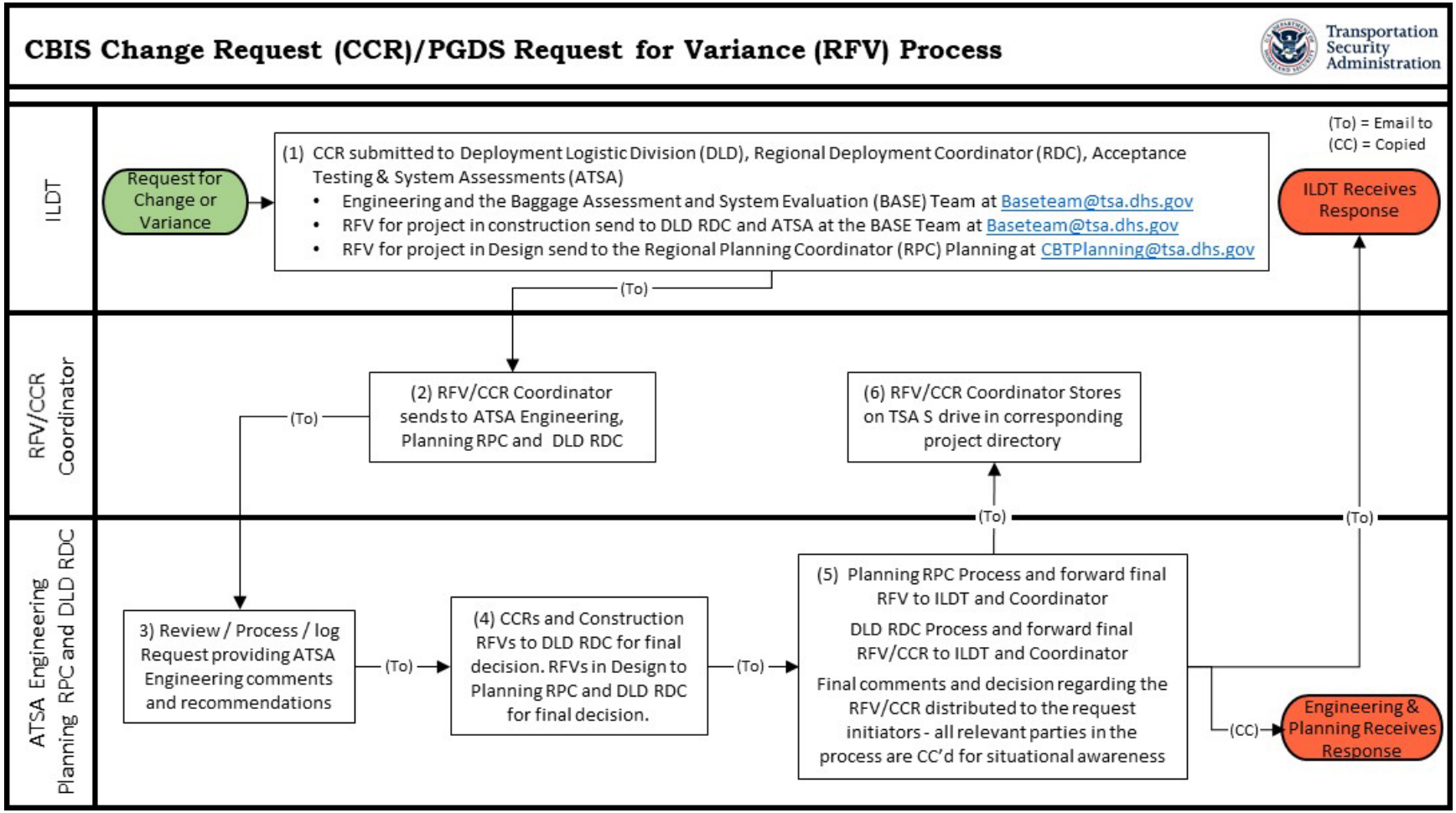
PLC or computer code changes to the CBIS are defined as:

- Any change that may affect any portion of the system throughput feeding either into or out of the CBIS
- Any change that may affect bag presentation to the EDS units (e.g., merges upstream too close causing double bags to enter)
- Any change to the EDS interface or to how the CBIS handles the bag IDs and decisions
- Any change to the CBIS tracking model (i.e., shaft encoding pulses, merges downstream allowing one bag to encroach into another bag's tracking window)
- Any changes to the bag allocation method
- Any change of any type from the exit of the EDS unit to the last clear bag divert point
- Any change of any type after the last chance divert point into the CBRA including the CBRA

CCRs are submitted to TSA ATSA Branch at Baseteam@tsa.dhs.gov.

Figure A.7 contains a flow chart that illustrates the overall change request process.

Figure A.7: Change/Variance Request Process



A.6.2 CBIS Change Request Example

The following is an example of a Change Request document provided by Siemens. Designers should follow the same outline when they submit a design change request.

1 Introduction

The purpose of this document is to describe the changes of the PLC code to be reviewed and approved by TSA or authorized agent.

2 Proposed Change Description

2.1 Purging of the Reconciliation Lookup Table for IR Bag

2.1.1 Detected Problem

When a bag arrives at CBRA with Unknown status it can be reintroduced in the system through the RI line. At the RI, the 10-digit IATA bag tag is scanned using a hand scanner or entered using the station display. Once scanned, the bag is tracked to EDS2 line and handled just like a new bag introduced at the ticket counter and scanned by ATR.

BHS includes a reconciliation scanner ATR SB1. The purpose of this scanner is to reconcile bags with the EDS decision when a bag is lost between exit of EDS and ATR SB1.

Because of the reconciliation process, special attention has to be paid to the reinserted bags that are screened twice. Procedure has to include provisions to prevent conditions when the bag on the first pass is cleared, on the second pass is alarmed, is lost in tracking downstream from the EDS and reconciled to the first clear decision. Algorithm of the current program handles this issue correctly. However, in order to completely avoid possibility of the manual intervention in the reconciliation process, additional safeguards are introduced.

2.1.2 Corrective Action

The 10-digit IATA bag tag of the re-inducted bag will be purged from the reconciliation table in order to guarantee that the bag will never reconcile with data from the first screening process.

Procedure was added to re-induct functionality (FC98, Network 69) to search through the look up table and delete the record created by the first screening.

2.1.3 Testing Procedure

In order to validate the requested change, the following test procedures will be performed:

1. Introduce a suspect bag upstream of ATR EDS2
2. Clear bag status from OSR after 10 sec to make sure that bag is routed to SB line
3. Delay bag at SB1-07 just after ATR SB1 to create loss of tracking
4. Re-induct bag from RI1-01
5. Verify that bag is Alarmed by EDS
6. Delay bag on SB1-02 to create loss of tracking
7. Verify that bag is reconciled on ATR SB1 to the Alarmed status and routed to CBRA

2.2 Adjustment of Tracking Parameters for SS3

2.2.1 Detected problem

During high volume baseline test bag ID exchange was detected on SS3-01. After analysis of the Bag History Report and CCTV recording it was determined that main reason was insufficient gap between bags created at the Ticket Counter merge leading to bag collisions.

Merge window parameters were adjusted and additional gapping introduced on the queue conveyors just downstream of the merge TC1-TC4.

2.2.2 Corrective Actions

In addition to already mentioned changes measures following adjustment are proposed:

1. Increase Run Time delay on EDS1-08 to allow downstream conveyors to clear before restarting EDS line and minimize possible tracking losses
2. Decrease Missing bag detection timer to improve tracking loss detection

2.2.3 Testing Procedure

Perform Added Bag Test on Zone 1A and 1B for the SS3 line. Added bag test will be performed according to the test procedures outlined in Appendix D.

3 EDS1-08 Stops When SS2 is Unavailable

3.1 Detected Problem

South Security Matrix consists of three lines SS1 – SS3. When SS2 becomes unavailable it also stops conveyor feeding all three lines - EDS1-08, even if SS3 is still available. A_Takeaway_Running parameter defines the name of the downstream conveyor in straight direction that needs to available for EDS1-08 to run. Parameter review showed that it was set to incorrect value.

3.2 Corrective Action

A_Takeaway_Running parameter needs to point to a conveyor downstream from EDS1_08. Replace the Current A_Takeaway_Running with the true A destination SS3_01.Running Forward. This will ensure that EDS1-08 will continue to run as long as SS3 is available.

3.3 Testing Procedure

1. Disable the SS2 line.
2. Place HSD-SS2 is in Automatic mode.

Expected Result: EDS1-08 to continue to run until SS3 become full.

A.6.3 CBIS Change Request Form

Figure A.8 contains an image of the CBIS Change Request Form. The CCR form can be obtained by e-mailing . It is also included as a tab in the Submittals Checklist and Comment Form.

Figure A.8: CBIS Change Request Form

CBIS Change Request
Email Completed CCR in Excel format (.xlsx) to Baseteam@tsa.dhs.gov

TRR ☐ **iSAT** ☐ **Post Com.** ☐

Airport Code:		**Bag Room / CBIS**		
Requested By:	**Name:**		**Company:**	
	Phone:		**Email:**	
BHS Installer / Maintenance	**Name:**		**Company:**	
	Phone:		**Email:**	
BHS Controls Support:	**Name:**		**Company:**	
	Phone:		**Email:**	
Date of Request:				

Type of Integration:	Fully	☐	Semi	☐	Mini	☐	Other	☐
Affected Area	Security Tracking Zone (STZ)	☐	Non-STZ	☐	Pre-EDS	☐	Post-EDS ☐	CBRA ☐
EDS Type, Model & Quantity								

Change Description:	
Detected Problem:	
Proposed Corrective Action/Change:	
Describe Testing to verify Change:	
Implementation Time (man hrs)	

Engineering Reviewer			Date:	
Engineering Comments				
Engineering Disposition	Approved ☐	Disapproved ☐	Deferred to DC ☐	
Change Validation Required (CVR)	DSD Site Lead ☐	TSA LOCAL ☐	ATSA ☐	Extended (Add to CVR Comments) ☐
Validation Type	Remote Analysis ☐	Live Operations ☐	Non-Operational Hours ☐	Other (Add to CVR Comments) ☐
CCR Validated By	Name	Date	Validation Pass ☐	Validation Fail (Add reason to CVR Comments) ☐
Documentation required by ATSA	2 weeks of BHS Reporting, Pre-CCR and Post-CCR ☐	Updated PLC CODE Required for all Changes ■	Updated Drawing ☐	Other (Add to CVR Comments) ☐
CVR Comments				

Checked Baggage Deployment Coordinator (CBDC)		Date:	
CBDC Comments			
CBDC Disposition	Approved ☐	Disapproved ☐	Deferred ☐

After CCR is validated, signed and dated, the person validating shall send a copy to the CBDC and Baseteam@tsa.dhs.gov.

NOTE: A copy of the updated PLC code shall be delivered to ATSA at Baseteam@tsa.dhs.gov upon completion of the CCRS.

The approval to implement the changes noted above does not constitute a change in the contract, or commit additional funding to the project. Contract modifications can only be made by the TSA Contracting Officer.

Where additional information has been requested by the TSA and it is not received within 48 hours, the CCR will be returned as rejected due to insufficient information.

A.6.4 MIA CBIS PLC Code Change Request Example

The following section showing an example of a Siemens CBIS Change Request Form has been reproduced and reformatted with permission.

1 Introduction

1.1 Contributors

Name/Function	Company	Department
Dave Suarez	Siemens	Controls Lead
Keith Oliver	Siemens	SR. System Engineer
Ramdas Kulal	Siemens	Controls Engineer
Rodney Maynard	Siemens	SR. System Engineer

1.2 Purpose

The purpose of this document is to submit change request to TSA to modify locked down MIA PLC code for items found during pre-ISAT, ISAT, final system testing, or by new change request issued to Siemens. This document includes changes to all screening matrixes contained within the MIA BHS. The content of this document include changes that are needed to correct issues and to add functionality that is required per the contract for the MIA BHS. These change requests are the result of punch list items or observed conditions that are not functionally correct or base scope requirements of the contract. The Additional Faults for the T1, T2 and T3 Doors is scope that has been added to Siemens via change request to allow the airport to meet security requirements needed prior to live operations.

2 Remove Bit from X5 Door Clear Fault Logic

2.1 Area controlled by Change Requested PLC

PLC	MCP	CONV	Area Controlled
32	MCP-14	X5-1, X5-2	East Matrix/Central Matrix

2.2 Executive Summary of Changed Impact

Criterion	Result
Effect on Tested Area	None
Effect on Tracking in the Tested Area	None
Effected PLC	PLC-32
Tested with Battelle (with current code)	Yes

2.3 Problem Detected

The door clear fault does not come on until the discharge conveyor of X5-2 is running which is down stream of the door X5-1.

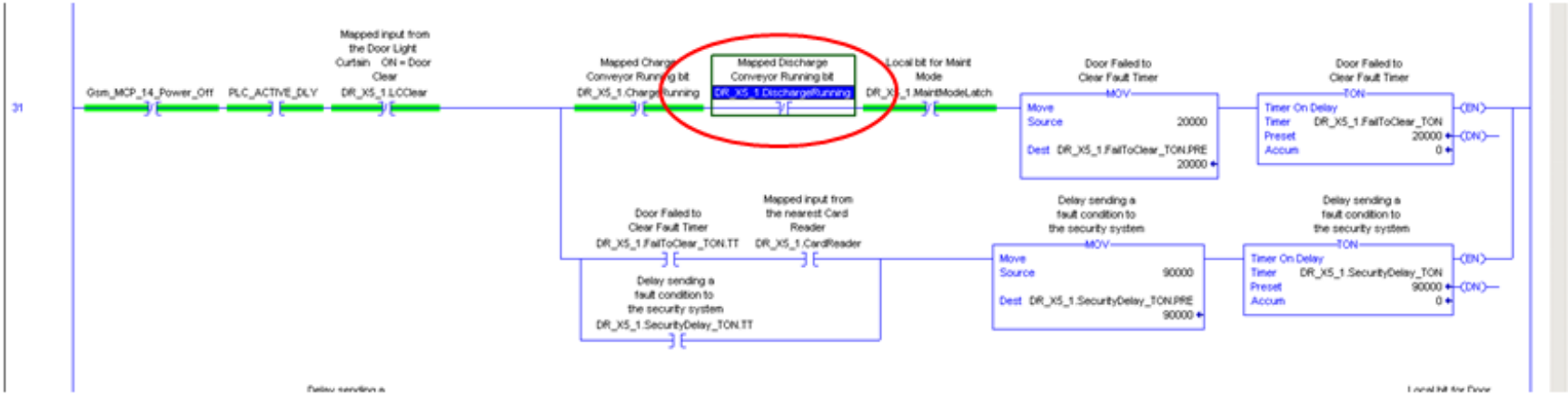
2.4 Corrective Action

The contact of “DR_X5_1.DischargeRunning” needs to be removed from the logic for the door clear fault.

NOTE: All A & B PLC’s will need to be updated with the same changes.

2.5 Current PLC Code

The screen shot below shows the PLC code in its current configuration in Routine “MCP_14_X5_Door” rung 31.



2.6 Proposed Change

The contact of “DR_X5_1.DischargeRunning” needs to be removed from the logic for the door clear fault.

3 Remove Temporary Logic from the C1 Door

3.1 Area controlled by Change Requested PLC

PLC	MCP	CONV	Area Controlled
19	MCP-92	C1 Door Logic	East Matrix/Central Matrix

3.2 Executive Summary of Changed Impact

Criterion	Result
Effect on Tested Area	None
Effect on Tracking in the Tested Area	None
Effected PLC	PLC-19
Tested with Battelle (with current code)	Yes

3.3 Problem Detected

Temporary bit signal disables the proper functionality of the door for the door faults. This bit was used for the testing and was never removed.

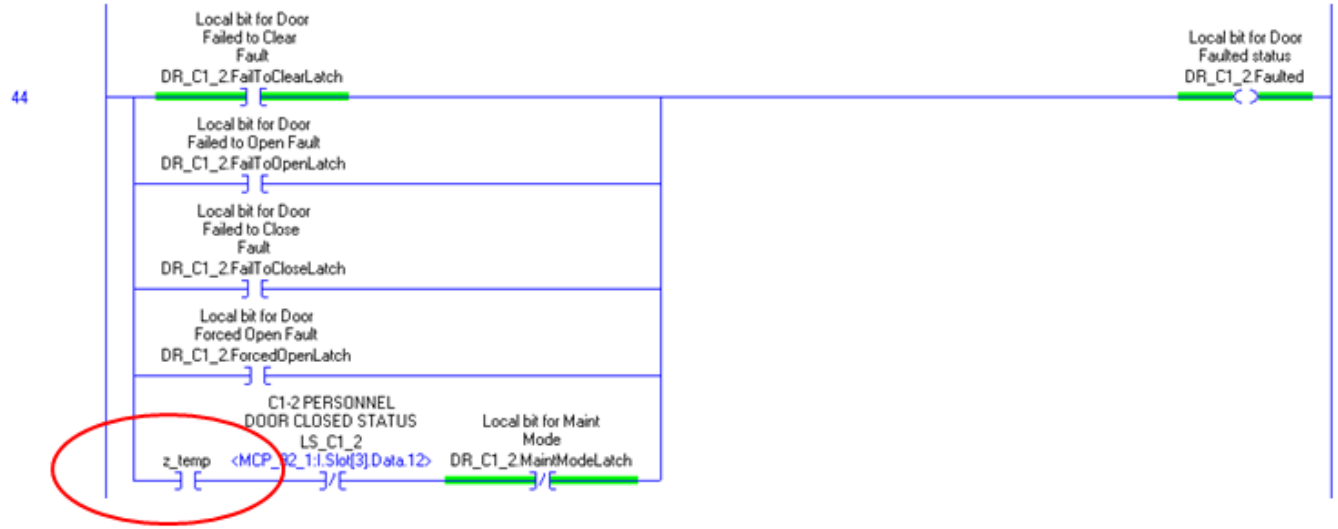
3.4 Corrective Action

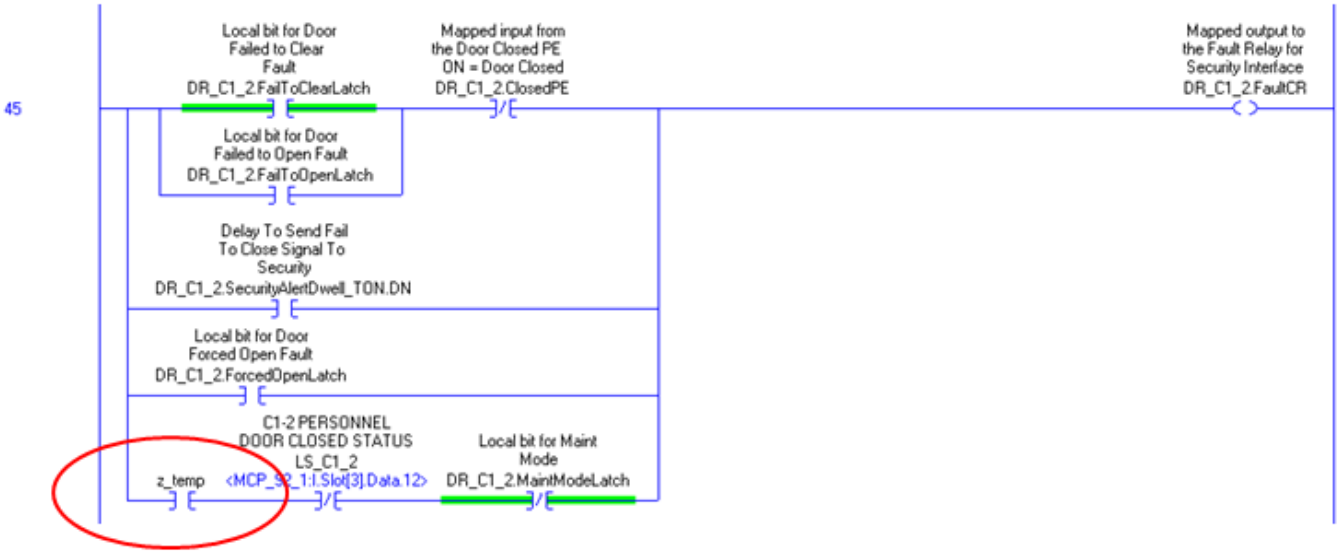
Remove the “Z_temp” signal bit from the logic for the door fault. No other graphics changes required, as well this change is not going to affect the tracking in this PLC.

NOTE: All A & B PLC’s will need to be updated with the same changes.

3.5 Current PLC Code

The screen shot below shows the PLC code in its current configuration in Routine “MCP_92_C1_2_Door” rung 44 and 45.


44
Local bit for Door Failed to Clear Fault
DR_C1_2.FailToClearLatch
Local bit for Door Failed to Open Fault
DR_C1_2.FailToOpenLatch
Local bit for Door Failed to Close Fault
DR_C1_2.FailToCloseLatch
Local bit for Door Forced Open Fault
DR_C1_2.ForcedOpenLatch
C1-2 PERSONNEL DOOR CLOSED STATUS
LS_C1_2
z_temp
<MCP_32_1:I.Slot[3].Data.12>
Local bit for Maint Mode
DR_C1_2.MaintModeLatch
Local bit for Door Faulted status
DR_C1_2.Faulted


45
Local bit for Door Failed to Clear Fault
DR_C1_2.FailToClearLatch
Mapped input from the Door Closed PE ON = Door Closed
DR_C1_2.ClosedPE
Local bit for Door Failed to Open Fault
DR_C1_2.FailToOpenLatch
Delay To Send Fail To Close Signal To Security
DR_C1_2.SecurityAlertDwell_TON.DN
Local bit for Door Forced Open Fault
DR_C1_2.ForcedOpenLatch
C1-2 PERSONNEL DOOR CLOSED STATUS
LS_C1_2
z_temp
<MCP_32_1:I.Slot[3].Data.12>
Local bit for Maint Mode
DR_C1_2.MaintModeLatch
Mapped output to the Fault Relay for Security Interface
DR_C1_2.FaultCR

3.6 Proposed Change

Remove the “Z_temp” bit from both rungs 44 and 45.

4 Remove AFI from T5 Door Logic

4.1 Area controlled by Change Requested PLC

PLC	MCP	CONV	Area Controlled
40	MCP-21	T5-4	East Matrix/Central Matrix

4.2 Executive Summary of Changed Impact

Criterion	Result
Effect on Tested Area	Yes
Effect on Tracking in the Tested Area	No
Effected PLC	PLC-40
Tested with Battelle (with current code)	Yes

4.3 Problem Detected

The T5-4 door failed to open fault did not work during testing with MDAD and it was found that the fault had been disabled with an AFI in the logic.

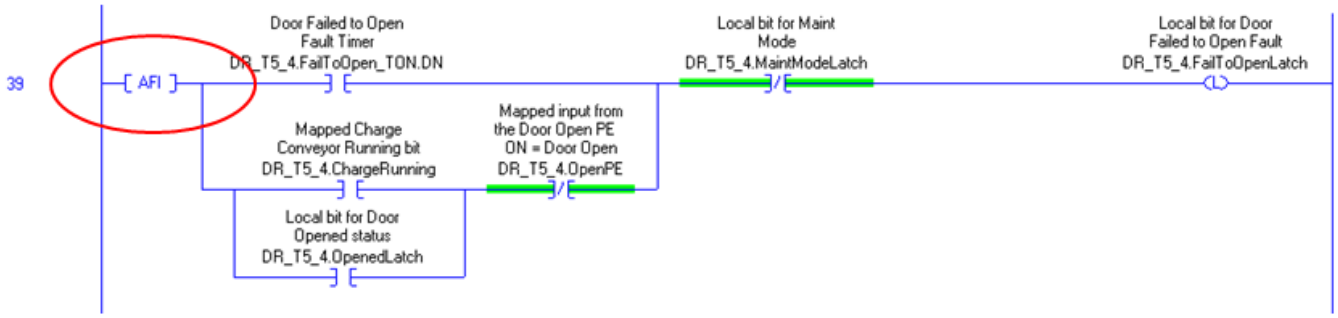
4.4 Corrective Action

Remove the AFI in the PLC logic. No other graphics changes required, as well this change is not going to affect the tracking in this PLC.

NOTE: All A & B PLC’s will need to be updated with the same changes.

4.5 Current PLC Code

The screen shot below shows the PLC code in its current configuration in Routine “MCP_21_T5_4_Door” rung 39.



4.6 Proposed Change

Remove the "AFI" from rung 39.

5 Change First Scan Delay Timer Preset

5.1 Area Controlled by Change Requested PLC

PLC	MCP	CONV	Area Controlled
PLC-32B, PLC-11B, PLC-13B, PLC-19B, PLC-22B, PLC-24B, PLC-27B, PLC-28B, PLC-33B, PLC-34B, PLC-37B, PLC-38B, PLC-39B, PLC-40B, PLC-42B, PLC43B, PLC-44B, PLC-45B	NA	NA	East Matrix/ Central Matrix/West Matrix/Cruise Matrix

5.2 Executive Summary of Changed Impact

Criterion	Result
Effect on Tested Area	Yes
Effect on Tracking in the Tested Area	No
Effected PLC	PLC-32B, PLC-11B, PLC-13B, PLC-19B, PLC-22B, PLC-24B, PLC-27B, PLC-28B, PLC-33B, PLC-34B, PLC-37B, PLC-38B, PLC-39B, PLC-40B, PLC-42B, PLC43B, PLC-44B, PLC-45B
Tested with Battelle (with current code)	Yes

5.3 Problem Detected

The PLC pairs have a minor issue during the process of synchronizing the PLC's. The B set of all PLC's are to be set .5 seconds longer on the First_Scan_Delay Timer so that the A PLC will always become the active primary.

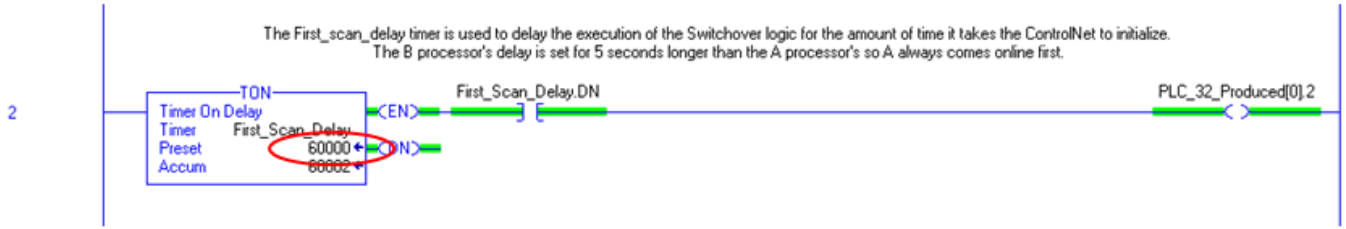
5.4 Corrective Action

Change the preset of the First_Scan_Delay Timer from 60000 to 65000 (6 seconds to 6.5 seconds).

NOTE: All A & B PLC's will need to be updated with the same changes.

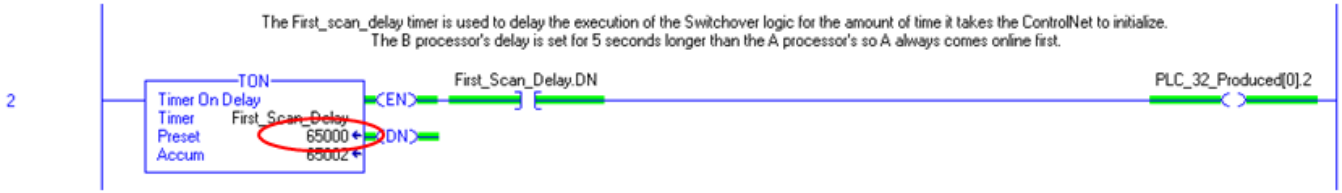
5.5 Current PLC Code

The screen shot below shows the PLC code in its current configuration in Routine "Switch_Over_Logic" rung 2.



5.6 Proposed Change

Changed timer preset to 65000.



6 Add Additional Faults for the T1, T2 and T3 Doors

6.1 Area controlled by Change Requested PLC

PLC	MCP	CONV	Area Controlled
19	108, 3, 4	T1, T2, and T3 door	East Matrix Central Matrix

6.2 Executive Summary of Changed Impact

Criterion	Result
Effect on Tested Area	Yes
Effect on Tracking in the Tested Area	No
Effected PLC	PLC-19
Tested with Battelle (with current code)	Yes

6.3 Problem Detected

The fire doors of T1, T2, and T3 are existing doors and do not have the functionality required to support live operations. Under a change request issued by MDAD to Siemens the door faults “Failed to Clear” and “Forced Open” are to be added.

6.4 Corrective Action

Add the logic for the door faults of “Failed to Clear” and “Forced Open.”

NOTE: All A & B PLC’s will need to be updated with the same changes.

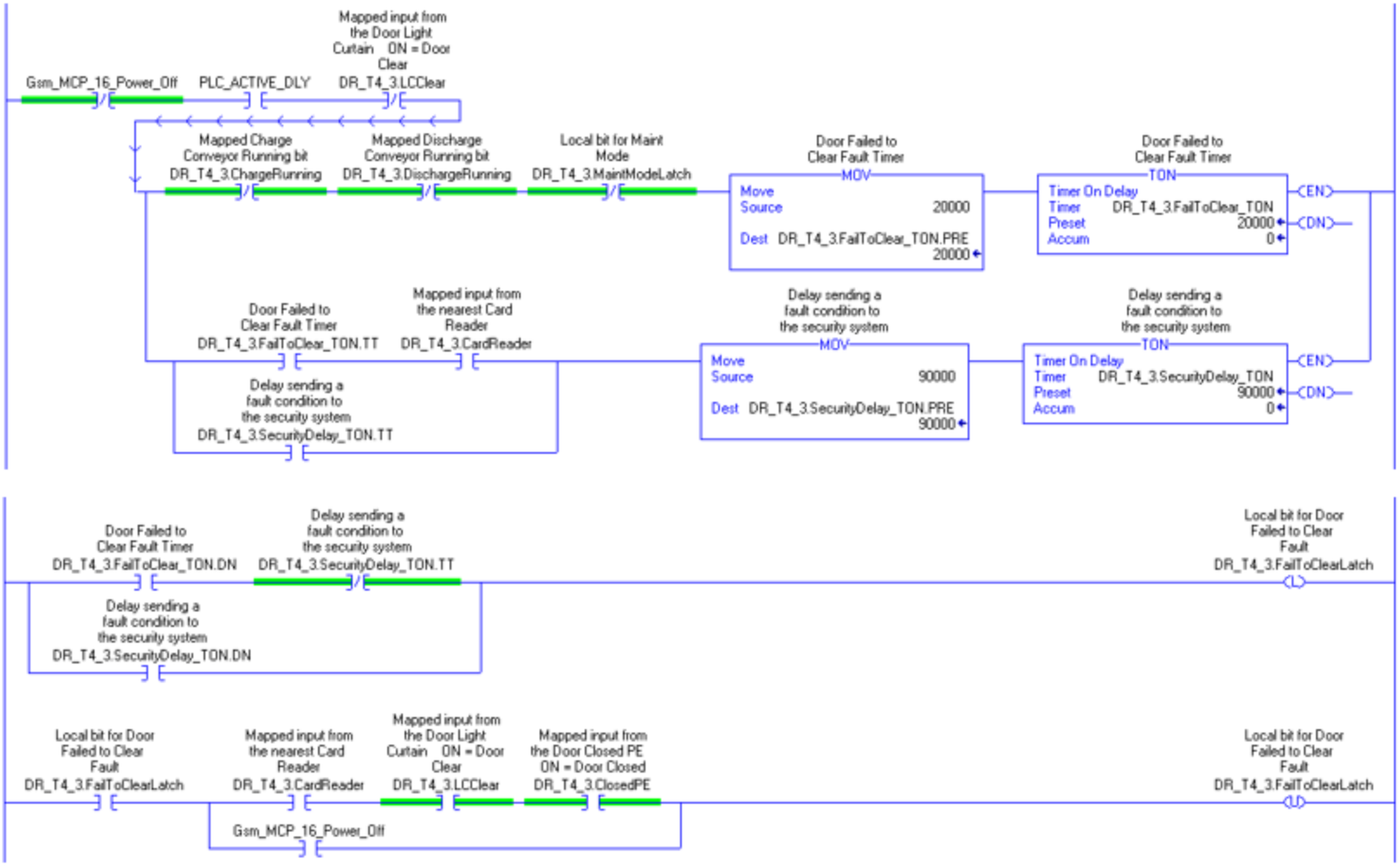
6.5 Current PLC Code

Current PLC code for these faults do not exist for these doors and will have to be added. Logic from other doors such as T4 will be used to create the logic for these new faults. Section A.10.6.6 represents the changes that will be required and is used as an example for the logic to be implemented.

6.6 Proposed Change

The below screen shots are from PLC 32 T4-3 door logic and represents the logic that will be used to implement the new faults that will be used on the T1, T2, and T3 doors.

Door Failed to clear logic.

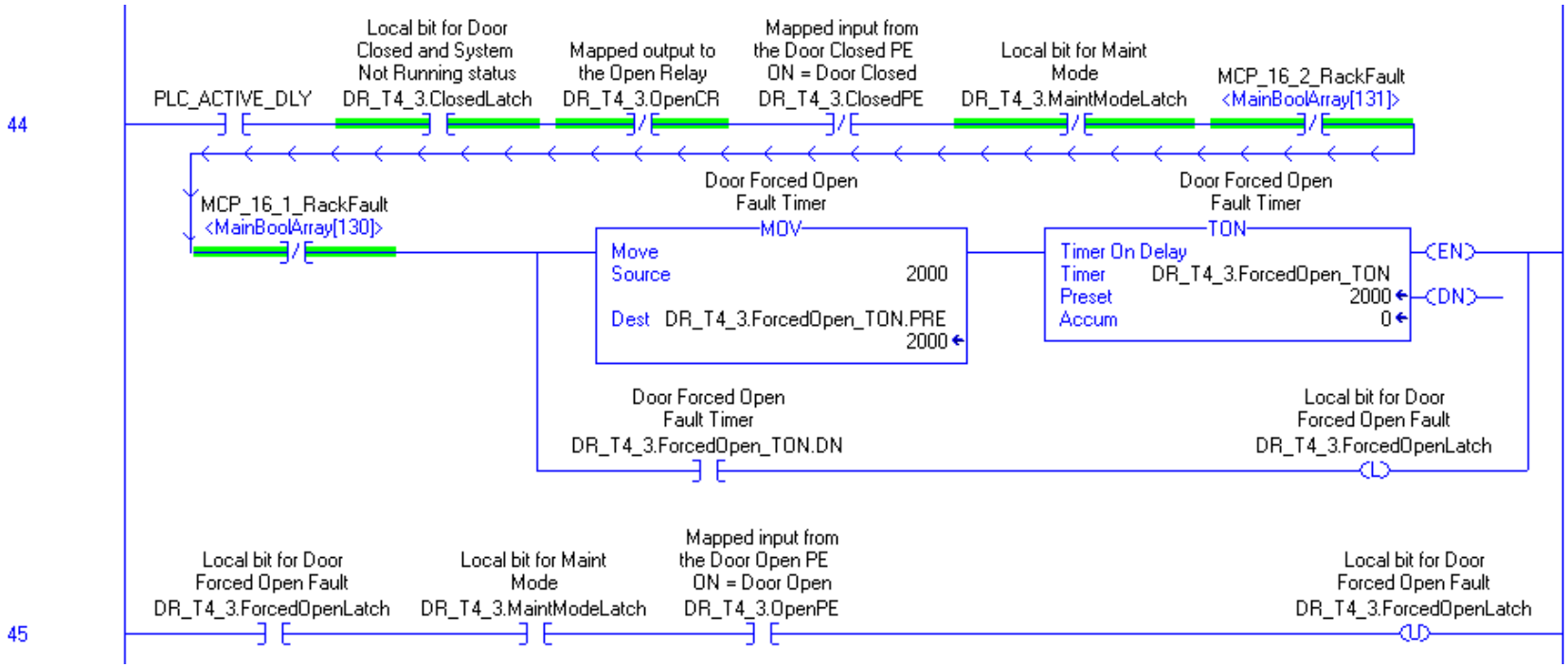


The Failed to clear latch is used in multiple places in the program and the screen shot below represents all locations.

Name: DR_T4_3.FailToClearLatch Refresh

Element	Container	Routine	Location	Reference	BaseTag	Destructive	Description
OTL	MainProgram	MCP_16_T4_3_Door	Rung 35	DR_T4_3.FailToClearLatch		Y	Local bit for Door Failed to Clear Fault
OTU	MainProgram	MCP_16_T4_3_Door	Rung 36	DR_T4_3.FailToClearLatch		Y	Local bit for Door Failed to Clear Fault
XIC	MainProgram	MCP_16_T4_3_Door	Rung 36	DR_T4_3.FailToClearLatch		N	Local bit for Door Failed to Clear Fault
XIC	MainProgram	MCP_16_T4_3_Door	Rung 46	DR_T4_3.FailToClearLatch		N	Local bit for Door Failed to Clear Fault
XIC	MainProgram	MCP_16_T4_3_Door	Rung 47	DR_T4_3.FailToClearLatch		N	Local bit for Door Failed to Clear Fault
XIC	MainProgram	MCP_16_T4_3_Door	Rung 50	DR_T4_3.FailToClearLatch		N	Local bit for Door Failed to Clear Fault
OTE	Software_Redundancy	Sync_Status	Rung 236	DR_T4_3.FailToClearLatch		Y	Local bit for Door Failed to Clear Fault
XIC	Software_Redundancy	Write_Status	Rung 236	DR_T4_3.FailToClearLatch		N	Local bit for Door Failed to Clear Fault

Door Forced Open logic.



Forced Open latch is used in multiple places in the program and the screen below shot represents all locations.

Name: DR_T4_3.ForcedOpenLatch Refresh

Element	Container	Routine	Location	Reference	BaseTag	Destructive	Description
OTL	MainProgram	MCP_16_T4_3_Door	Rung 44	DR_T4_3.ForcedOpenLatch		Y	Local bit for Door Forced Open Fault
OTU	MainProgram	MCP_16_T4_3_Door	Rung 45	DR_T4_3.ForcedOpenLatch		Y	Local bit for Door Forced Open Fault
XIC	MainProgram	MCP_16_T4_3_Door	Rung 45	DR_T4_3.ForcedOpenLatch		N	Local bit for Door Forced Open Fault
XIC	MainProgram	MCP_16_T4_3_Door	Rung 46	DR_T4_3.ForcedOpenLatch		N	Local bit for Door Forced Open Fault
XIC	MainProgram	MCP_16_T4_3_Door	Rung 47	DR_T4_3.ForcedOpenLatch		N	Local bit for Door Forced Open Fault
XIC	MainProgram	MCP_16_T4_3_Door	Rung 50	DR_T4_3.ForcedOpenLatch		N	Local bit for Door Forced Open Fault
OTE	Software_Redundancy	Sync_Status	Rung 239	DR_T4_3.ForcedOpenLatch		Y	Local bit for Door Forced Open Fault
XIC	Software_Redundancy	Write_Status	Rung 239	DR_T4_3.ForcedOpenLatch		N	Local bit for Door Forced Open Fault

7 VFD Faults Using MCP Power Off Bit

7.1 Area controlled by Change Requested PLC

PLC	MCP	CONV	Area Controlled
All Security Line PLC's 27, 28, 35, 36, 37, 39, 45	NA	All Security Lines	East Matrix Central Matrix

7.2 Executive Summary of Changed Impact

Criterion	Result
Effect on Tested Area	Yes
Effect on Tracking in the Tested Area	No
Effected PLC	All Security Line PLC's, 27, 28, 35, 36, 37, 39, 45
Tested with Battelle (with current code)	Yes

7.3 Problem Detected

During system testing it was observed that an intermittent issue would occur with the VFD operated conveyors that they would become idle and upstream conveyors would cascade and no fault would be present on the graphics. During the commissioning of the system an issue occurred that when the MCP was powered off that contained VFD's all the faults for the VFD's would be displayed on the graphics. A rung was created to prevent this however if there is a fault on the C-Net card of the VFD the graphics will not display the fault. Normally the Comm Ok bit would be

used in parallel with the MCP Power Off bit so that if the C-Net card of the VFD faulted without a VFD fault it would still be indicated on the graphics as a VFD fault. A separate change request has been submitted to MDAD to add C-Net node faults to the graphics.

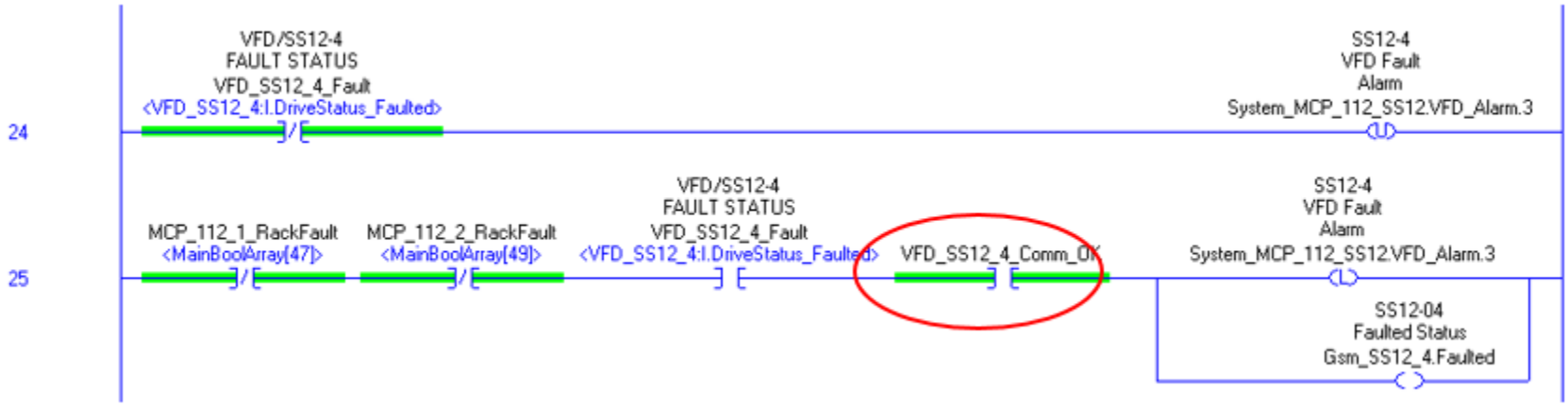
7.4 Corrective Action

The VFD_xxx_Comm_OK bit should be replaced with the MCP Power Off bit. The MCP Power Off logic was added later to the PLC's to indicate the loss of control power within each MCP. The corresponding MCP bit should be used with the corresponding VFD's.

NOTE: All A & B PLC's will need to be updated with the same changes.

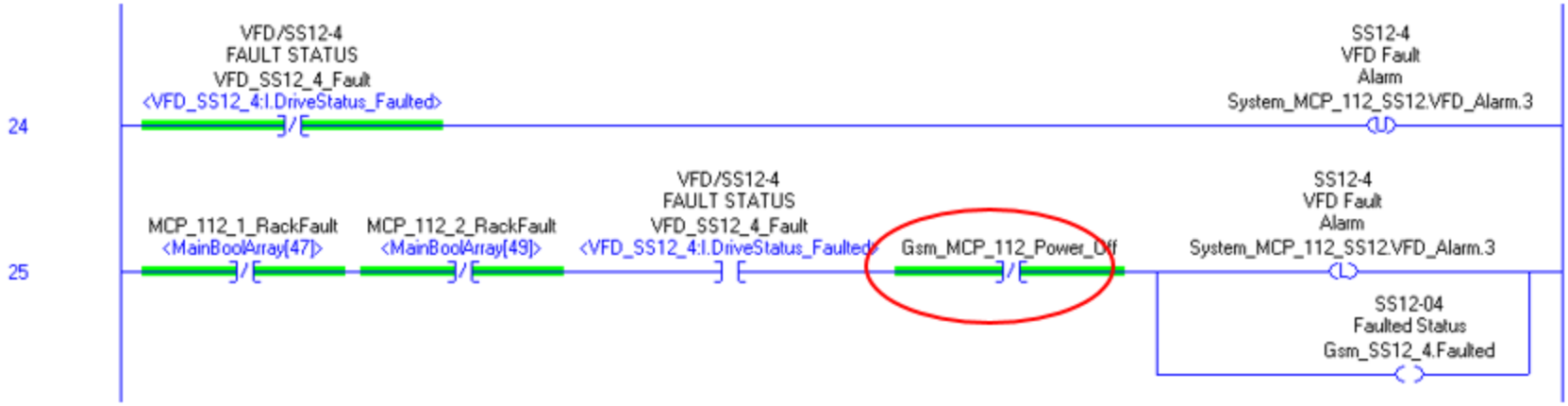
7.5 Current PLC Code

All faulted logic for the VFD's is the same in all matrix PLC's so only one is used in this example. The below screen shot is for the VFD fault on SS12-4.



7.6 Proposed Change

The below screen shot is the example for the VFD fault of SS12-4 using the MCP-112 Power Off bit. Using this instead of the Comm Ok bit will prevent the fault from showing on the graphics if the MCP is powered off but allow the fault if the C-Net card of the VFD is faulted.



A.7 Government Furnished Information Requests

TSA often has historical and forecasted data that may prove beneficial to designers and planners of BHSs that incorporate a CBIS. GFI is information supplied by the TSA's engineering department and is intended to aid in the design of BHS projects, specifically projects that involve the CBIS portion of a BHS.

This data, offered at the preliminary stages of the design process, is contingently applicable, and is very dependent upon the scope of the project. In order for us to supply GFI, we need to gain a perspective about the overall scope of the project and a general understanding of the project's intent. The attached form is used for this purpose. Once we receive the form, we will endeavor to supply the following:

FDRS data: this is the historical data of the quantity of the bags that go through the EDS units. If specific EDS unit numbers are supplied:

- The TSA can supply the 10 minute peaks of every day for the most recent year's span, by EDS grouping. This will be represented by two graphs, indicating the peaks chronologically and in ascending order. We'll also indicate the ADPM day, as well as the day that corresponds to the 85 percentile for a year's sampling.
- We'll also supply a graph of the baggage rate for the 85% day and the peak day. These graphs will show the average of 10 minutes, in 1-minute increments (rolling 10 minute bins), for the 85% and peak days. They do not include the Surge Factor.
- If available, we'll supply the baggage rate graphs of the individual EDS units for the 85% day. These graphs will indicate the baggage rate for each minute, by the minute (no averaging, no Surge Factor).

Utilizing the FAA's Terminal Area Forecast, we'll supply the anticipated Overall Growth and the Average Compounded Yearly Growth. We'll need to know the overall span of the project, from date of design to Date of Beneficial Use plus five years (DBU+5). This span is typically seven to ten years.

Utilizing the TSA's Enhanced Staffing Model, we may be able to supply a Baggage rate profile based on Airlines or specific bag zones. (Knowledge of both the bag zones and the Airlines within each zone, and the correlation of each to a proposed design, are requisite. This information is usually obtainable by coordinating with the local TSA and the Airline representatives).

Utilizing the TSA – Operations Improvement Branch's "ESM (year) – OIB Bag Zone Analysis" we may be able to offer some airline specific values for "Bags per Passenger" that are useful as approximate values. The new ESM provides the capability to calculate the TSA's weekly staffing requirements for an airport terminal by hour, by day of the week. By using the ESM application, users will continue to define experiments, configure airport terminals, and share experiments with other users. ESM will generate a staffing demand in 5 minute increments for a one-week period based on the configuration data, flight schedule demand data, and service measure of effectiveness (MOE) specified in an experiment. ESM will also provide statistical results for each experiment in reports.

We can often suggest CBRA baggage processing times that are national averages and would need adjustment based on location of project.

TSA encourages participation in Technical Interchange Meetings throughout the design review process to allow for open lines of communication and a vehicle to resolve issues or concerns as they arise. Figure A.9 and Figure A.10 illustrate the overall GFI Request process for TSA- and airport-funded designs respectively. Figure A.11 contains a copy of the GFI request form.

Figure A.9: GFI Request Process - TSA Funded Designs

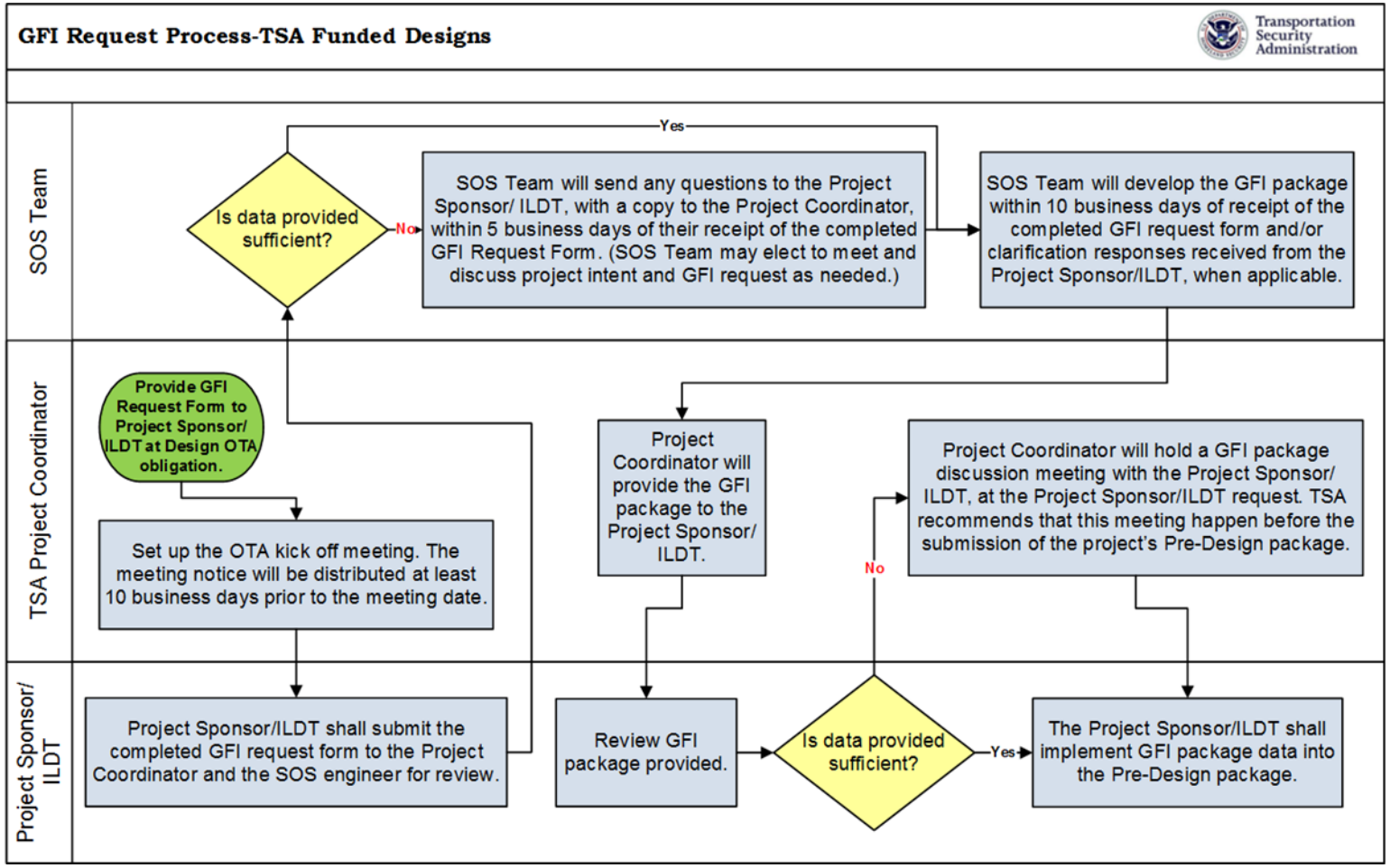


Figure A.10: GFI Request Process - Airport Funded Designs

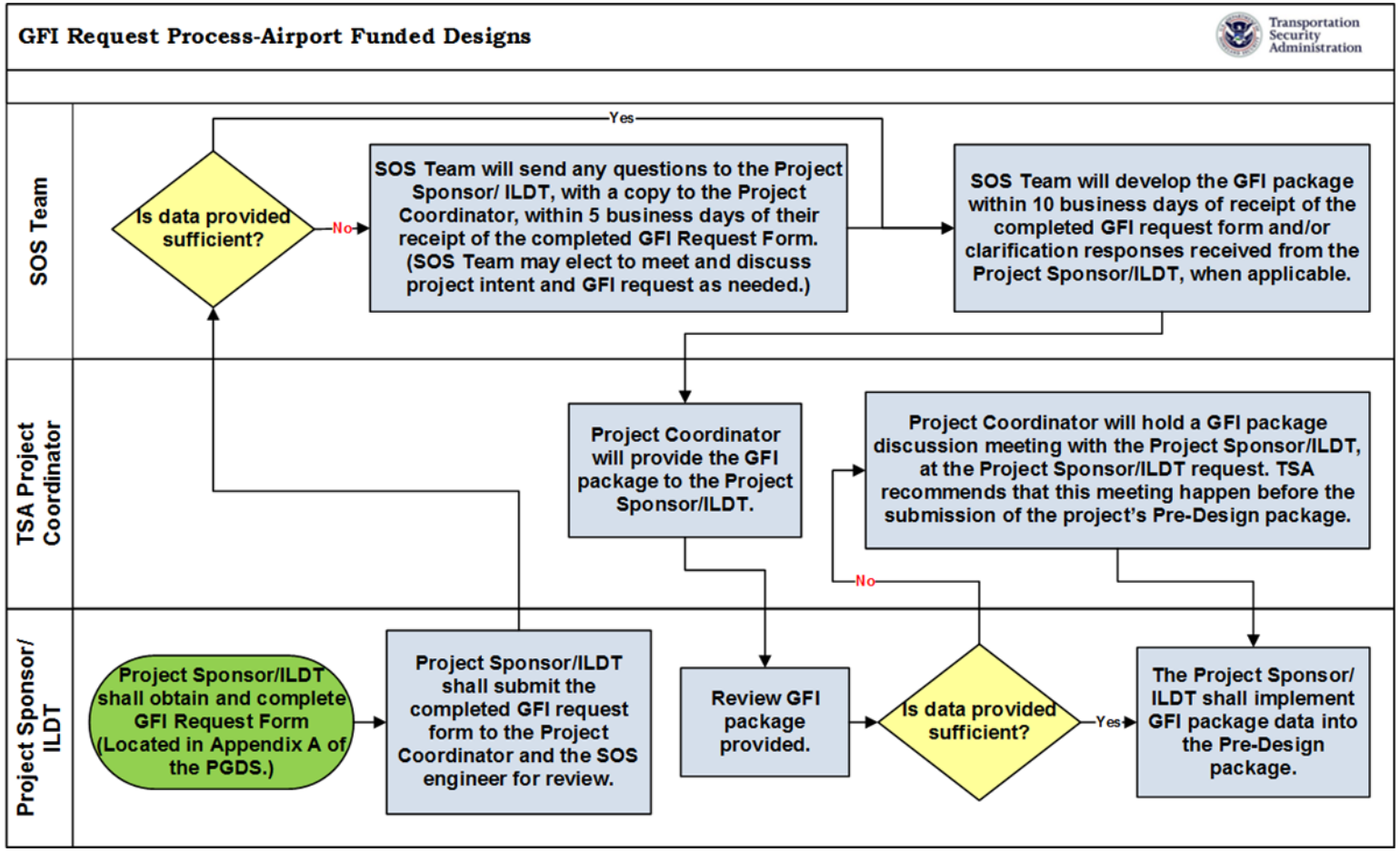


Figure A.11: GFI Request Form

Government Furnished Information (GFI) Request Form				
Airport Code:			Terminal/Area/CBIS:	
Requestor:	Name:		Company:	
	Phone:		Email:	
Request Date:				
Local TSA (FSD/AFSD) POC:	Name:		Email:	
	Phone:			
Project Scope: *Please detail the proposed CBIS changes.*				
Request Type (Check all that apply):	☐	FDRS	☐	CBRA processing rates
	☐	Baggage Rate Profiles	☐	Terminal Area Forecast (TAF)
	☐	Bags Per Passenger (BPP)	☐	
	☐		☐	
Request Type Explanation area:				
Airline/Airport Zone(s)				
EDS Serial Nos.:				
Date of Expected Pre-Design Submittal to TSA:				
Other Comments:				

A.8 Industry Comment Template

The TSA Acquisition Program Management (APM) will be the recipient of all comments regarding proposed updates to the PGDS. All comments will be reviewed and considered in a timely manner. The TSA values comments and input from industry stakeholders, but only those comments and input determined to enhance and improve the PGDS will be incorporated in the next release of the PGDS. An example of the standard form for comments is provided in Figure A.12 below.

Figure A.12: Standard Form for Industry Comments

Transportation Security Administration

Checked Baggage Inspection Systems Planning Guidelines and Design Standards (PGDS) V6.0
Comment Form

Comment ID	Status	Disposition	Chapter	Section	Paragraph No.	Page No.	Author	Comment/Rationale	Suggested Revision	TRC Decision

Comments should be submitted to the pgds@dhs.gov mailbox, on the comment form at the Sam.gov website using the search term “PGDS”.

APPENDIX B:

GENERIC EXAMPLES OF CHECKED BAGGAGE INSPECTION SYSTEMS

B.1 Introduction

This appendix provides generic examples of various design concepts of CBISs, relevant operational assumptions for those examples, and specific best practices related to the CBIS examples to supplement the information contained in Chapter 12 of the PGDS.

The high-level generic examples, which are not highly detailed, but rather convey a conceptual screening system, are provided to assist planners at the Pre-Design Phase of CBIS design with the development of conceptual alternatives. The examples are not site-specific and should not be used as is. These examples are intended to serve as a starting point for planners to provide ideas on different concepts of CBISs, some of the pros and cons of each concept, and some of the best practices that relate to specific CBIS design concepts. When developing design concepts, planners should consider local operational and spatial conditions, which are likely to significantly influence the actual CBIS design concepts developed.

The following generic examples of CBIS concepts are presented in this appendix:

- Two variations of linear CBIS design concepts (A, B)
- One ICS CBIS design concept (C)

B.2 Methodology for Developing Generic Examples

The three examples of linear CBIS or ICS designs were developed and evaluated based on in-line system types using Type I EDS units as the basis of design. Higher throughput could be accomplished in most cases by a substitution of the EDS units. This substitution may require changing the layout of the main EDS processing system (i.e., changing BHS conveyors in the immediate vicinity of the EDS units, resizing of the CBIS, and CBRA), but may not require changes to ticketing/curbside belts and bag makeup/sortation conveyors.

In some examples, other minor layout revisions may be required to provide a better match between BHS conveying capacity and EDS design throughput, but these revisions are unlikely to have much effect on BHS capital costs or building area requirements. Planners should consider such modifications when developing specific CBIS design concepts. The substitution of a higher capacity EDS unit will likely result in revised values for OSR and ETD screener staffing requirements and for the associated equipment/space requirements for this equipment and personnel.

A useful strategy may be to design a system based initially on the use of Type I EDS units and subsequent replacement by higher throughput EDS units as demand increases. This strategy may provide a convenient method of achieving a 35% to 40% increase in system throughput capacity. There is a chance that significant changes to the OSR and CBRA will be required due to these capacity increases as stated above.

The following assumptions were the basis for developing the generic CBIS examples:

- A separate line is used for OS bags. These bags are too large to be loaded on the ticketing/curbside belts (e.g., surfboards, skis, and golf clubs) and are screened using ETD for primary screening.
- A bypass belt is used (except in mini in-line applications) to divert OOG bags that will not fit the aperture dimensions of the EDS tunnel. The diverter directs OOG bags directly to the CBRA, bypassing the EDS units.
- A minimum of 45 seconds of travel time is provided after the bag has been screened by an EDS unit for OSR processing in in-line CBIS designs. Mini In-line systems will be required to have at least 30 seconds of travel time.
- EDS and ETD throughputs are consistent with the equipment described in Chapter 3.
- Mainlines will be capable of delivering bags to the EDS units to equal the capacity of the total non-redundant EDS units at a minimum. Mainlines taking bags away from the EDS unit will be capable of transporting bags equal to or greater than the capacity of the non-redundant EDS units.

B.3 Generic Examples of Linear CBIS Design Concepts

Linear CBIS design concepts typically have a relatively straight forward linear conveyor system transporting baggage from ticketing/curbside take-away belts to the screening zones and from the screening zones to the CBRA zones and bag makeup devices.

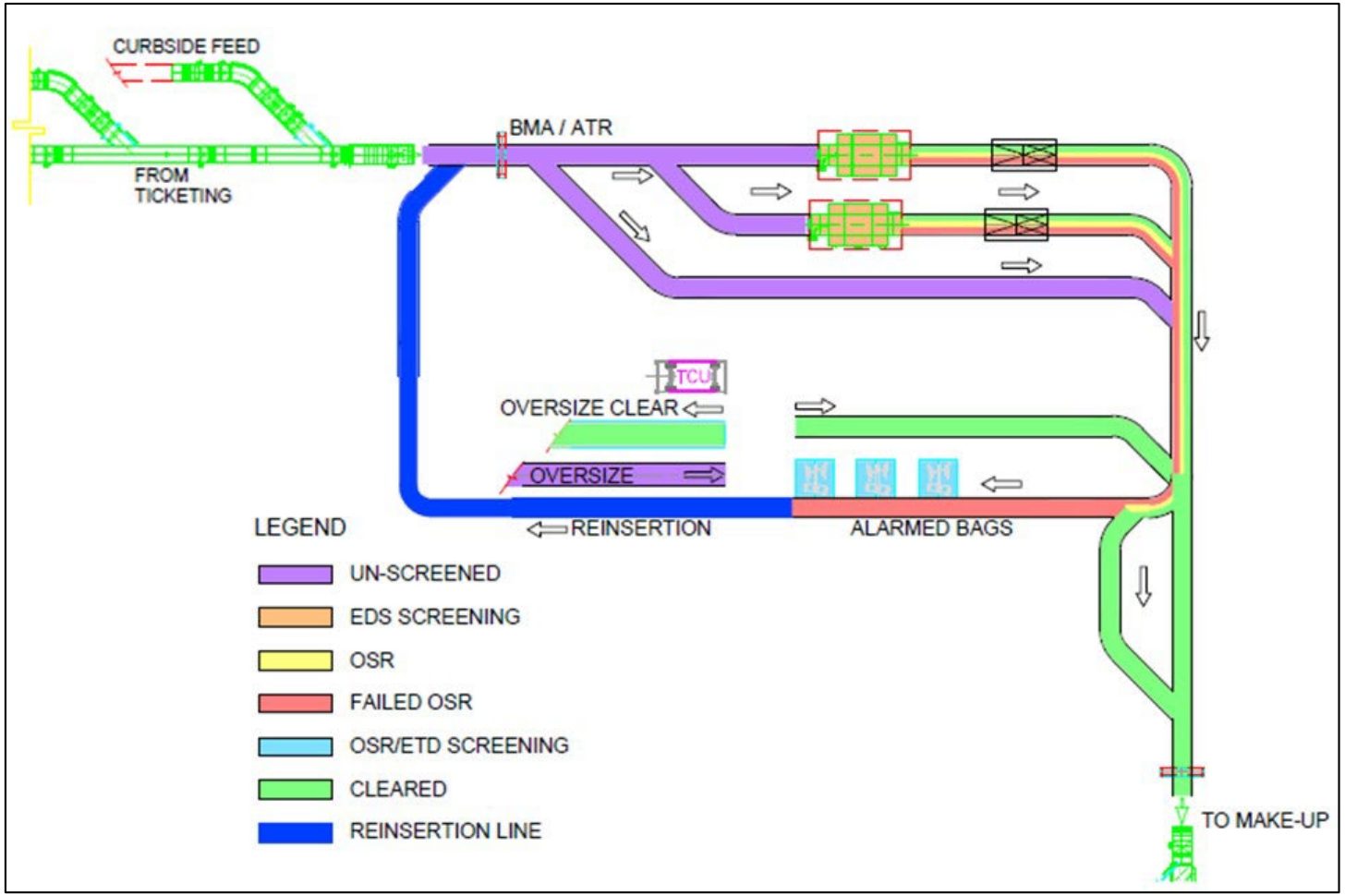
Two variations of linear CBIS design concepts are described below:

- **Linear CBIS Design Concept A** – Baggage is transferred from ticketing on a single conveyor to the EDS, and vertical sorters or 45-degree diverters separate clear/alarmed bags soon after the bags exit the EDS units.
- **Linear CBIS Design Concept B** – Similar to design Concept A, but intended to handle a higher volume of bags transferred from the induction lines.

B.3.1 Linear CBIS Design Concept A

An example layout of linear CBIS design Concept A is shown in Figure B.1.

Figure B.1: Linear CBIS Design Concept A



B.3.1.1 Description of Linear CBIS Design Concept A

Ticketing and curbside take-away belts are merged into a single mainline conveyor belt leading to the security screening and bag makeup area. A BMA is used to identify OOG bags that exceed the available cross-sectional area that can be accommodated by the EDS units. OOG bags are diverted to a conveyor leading directly to the CBRA for manual inspection and clearance. All other bags proceed to a diverter that allocates bag flow between the two EDS units. After screening by EDS equipment, bags proceed to a vertisorter (a 45-degree diverter with parallel conveyors could also be configured) where alarmed bags are transported to an accumulation conveyor, pending OSR inspection by TSA personnel.

Bags that are cleared by the EDS units are immediately segregated from alarmed bags and diverted to a single clear bag line leading to the baggage makeup area. There is a subsequent merge point for bags cleared by OSR or ETD. Upon reaching the end of the OSR conveyor, bags that have been cleared by TSA personnel are diverted (vertisorter or 45-degree diverter) to a cleared bag belt, which, in turn, merges with the clear bag line leading to the baggage makeup area, as described above. Bags that are not cleared by TSA personnel (including bags for which no clearance decision has been reached by the time the bag reaches the decision point) will default to the CBRA for manual inspection.

Positive bag tracking controls are used to monitor the locations of all bags processed by the EDS units and to enable EDS images of screened bags sent to the CBRA to be accessed by TSA screening personnel. EDS images are transferred to the corresponding ETD inspection position to assist with directed ETD screening of the bag. Bags that are cleared after ETD screening and search are loaded onto a return conveyor, which merges with the clear bag line leading to the bag makeup area. Any “threat” bags identified during the ETD screening and search process are either resolved or disposed of per the current TSA checked baggage SOP, which typically involves the local law enforcement officer.

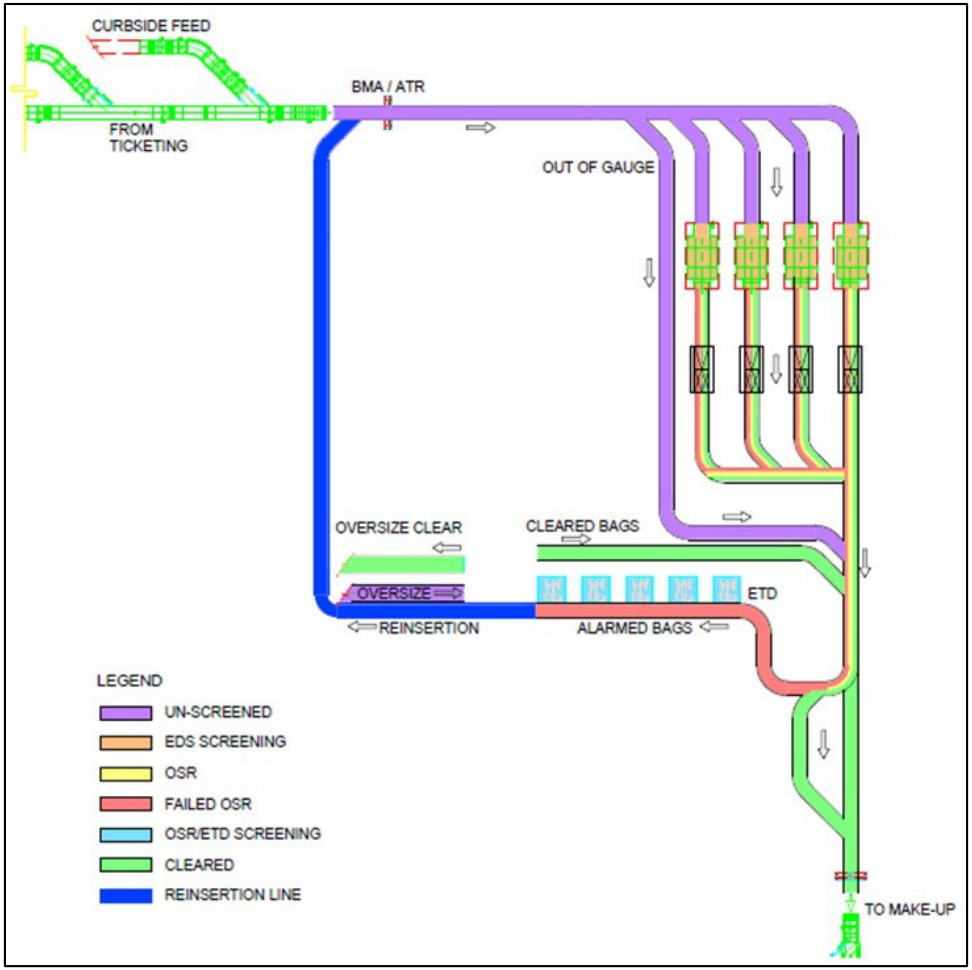
B.3.1.2 Evaluation of Linear CBIS Design Concept A

This design concept is well suited for a moderately sized application. However, the concept may involve a high cost for EDS units because a redundant unit may be necessary to maintain operations in the event of unit failure, resulting in average unit utilization of about 50% during peak period operations when both units are operational. CBRA space and equipment requirements should be identified in light of the agreed-upon contingency plan developed by the Project Sponsor (see Section 5.7.2). Separation of alarmed and cleared bags immediately downstream of the EDS units minimizes the risk of bag mistracking by diverting the majority of bags to an untracked conveyor environment, but involves some system complexity (PLC programming due to a larger tracking zone) and cost.

B.3.2 Linear CBIS Design Concept B

An example layout of linear CBIS design Concept B is shown in Figure B.2.

Figure B.2: Linear CBIS Design Concept B



B.3.2.1 Description of Linear CBIS Design Concept B

Ticketing and curbside take-away belts are merged into a single mainline conveyor belt leading to the security screening and bag makeup area. A BMA is used to identify OOG bags that exceed the available cross-sectional area that can be accommodated by the EDS units. The OOG bags are diverted directly to a conveyor leading to the CBRA for manual inspection and clearance. All other bags proceed to a diverter zone, typically consisting of three 45-degree diverters, which divide bag flow among four EDS units. After EDS screening, bags proceed to a vertisorter (a 45-degree diverter with parallel conveyors could also be configured), where alarmed bags are transported onto an accumulation conveyor pending OSR screener decision.

Bags cleared by the EDS units are diverted onto a clear bag line leading to the bag makeup area to be discharged to a sort system. Upon reaching the end of the OSR accumulation conveyor, bags that have been cleared by TSA personnel are diverted (vertisorter or 45-degree diverter) to a cleared bag belt, which, in turn, merges with the cleared bag line leading to the bag makeup area.

Bags that are not cleared by TSA personnel (including bags for which no clearance decision has been reached by the time the bag reaches the decision point) default to the CBRA for manual inspection. Positive belt tracking controls are used to monitor the location of all bags processed by the EDS units and to enable images of screened bags sent to the CBRA to be accessed by TSA screening personnel who perform directed ETD screening of the bag. Bags cleared after ETD screening and search are manually transferred onto a return conveyor, which merges with the cleared bag line leading to the bag makeup area. Any “threat” bags identified during the CBRA process are either resolved or disposed of per the current TSA checked baggage SOP, which typically involves the local law enforcement officer.

In most systems with this throughput capacity, the cleared bag line conveyor leading to the bag makeup area leads to a separate sortation area, where bags are typically distributed among a number of makeup loops or piers for final sort to individual flights. This process usually requires an ATR and manual encode spur upstream of the makeup loops or piers. Sortation to individual loops or piers is typically via vertisorters or 45-degree diverters, as appropriate. The sortation component of the BHS is not included in this analysis

B.3.2.2 Evaluation of Linear CBIS Design Concept B

The use of multiple EDS units increases the average peak period use of each unit (compared with Concept A) from about 50% to about 75%, as redundant screening equipment represents a smaller percentage of the system. However, the baggage conveying systems serving the EDS units in this concept are more complex and costly. Linear CBIS design Concept B depends on a single mainline conveyor feeding bags to the EDS unit array and a single mainline conveyor feeding bags to the makeup/sort area. The bag throughput rate on these single conveyors is also relatively high during peak periods. This concept generally requires a separate sortation system downstream of the EDS/ETD screening area to sort bags by flight or by airline.

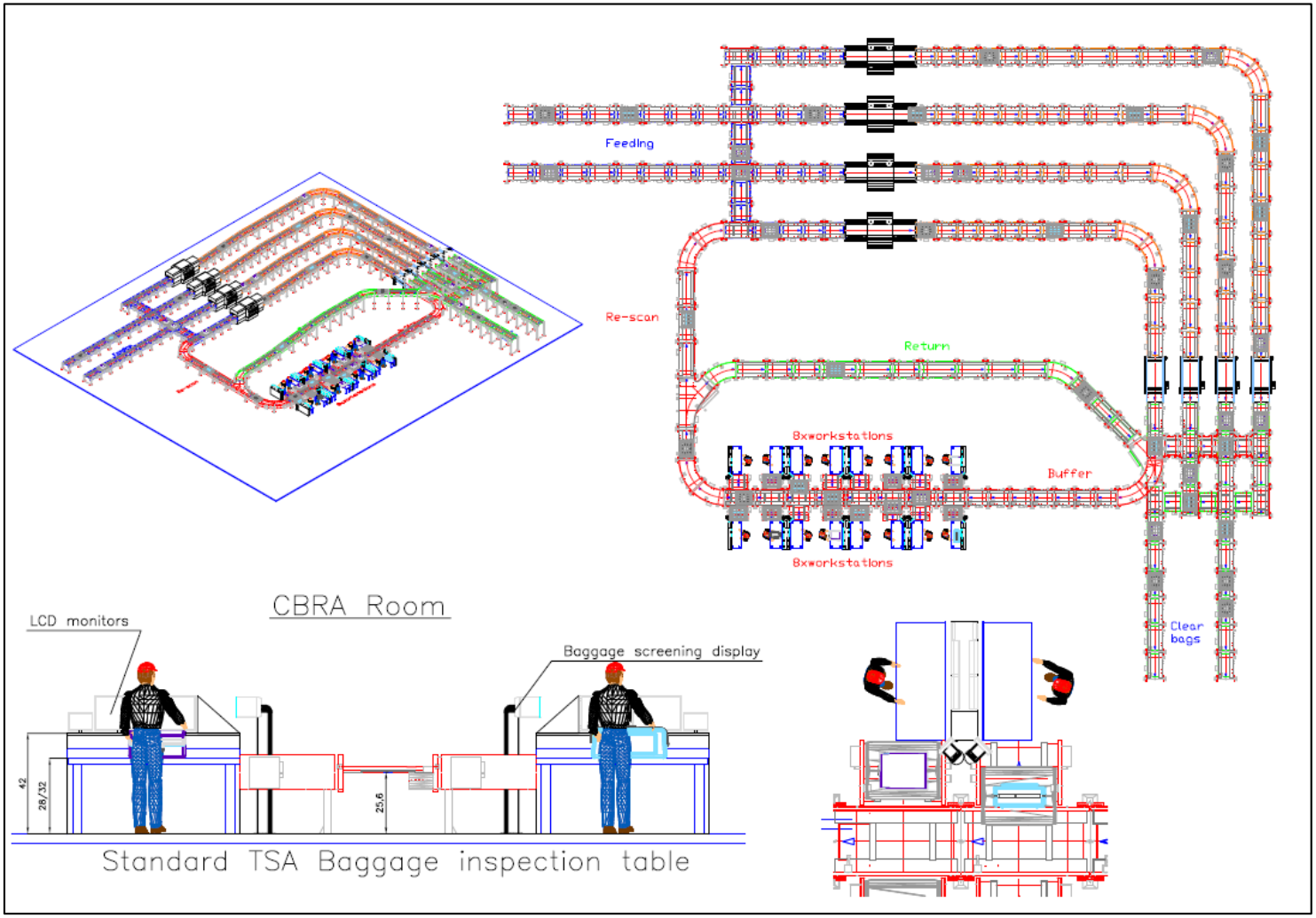
As with linear CBIS design Concept A, the design for Concept B maintains the separation of cleared and alarmed bags; Concept B potentially has higher reliability compared with Concept A because the additional conveyors leading to a higher number of EDS units can compensate for an EDS unit failure.

B.4 Generic Examples of Individual Carrier System-Based CBIS Design Concepts

An ICS-based CBIS design concept typically uses individual carriers to carry baggage through a transport and sortation system, which allows for the distribution of bags to the EDS units as well as to the CBRA, and if so designed, for the automated sortation of bags to multiple makeup devices. ICSs typically consist of a closed-loop conveying system on which special-purpose carriers (each accommodating a single bag and possessing a unique RFID tag) are transported to the EDS. In this type of system, the bag remains in the carrier throughout the screening and sortation processes. Alarmed baggage is transported to the CBRA (in the carrier) while cleared baggage is conveyed to the sortation system. The ICS concept is presented to provide planners with a potential CBIS concept for consideration during the Pre-Design Phase.

This concept is illustrated schematically on Figure B.3, which is not representative of a physical equipment layout and does not show upstream ATRs. While this concept is unconventional, it is nonetheless presented to provide planners with a potential CBIS concept for consideration during the Pre-Design Phase.

Figure B.3: Individual Carrier System-Based CBIS Design Concept C



B.4.1 Description of Individual Carrier System-based CBIS Design Concept C

Bags from the ticketing/curbside take-away belts are delivered to three delivery belts and pass a combined BMA/ATR position where they are measured and identified. OOG bags are immediately diverted to a bypass line leading to a combined OS/OOG CBRA. Standard bags are transported under tracking control to a carrier loading and induction unit, where they are loaded onto a vehicle or carrier and a destination is assigned to the carrier. The carrier and bag then proceed to one of four EDS units, with automatic flow balancing to equalize the use of available EDS units. Bags that clear EDS screening are directed to the baggage sortation system. Bags that alarm are reviewed through the OSR decision process. OSR clear bags are directed to the baggage sortation system. OSR alarm bags are directed to CBRA for further processing. After CBRA processing has cleared the bag, the bag is directed to the baggage sortation system. An ICS carrier may be permitted to keep the bag in the carrier through the EDS screening process if the carrier meets TSA validation to not impact EDS detection per Section 3.5.1. An ICS carrier may be permitted to keep the bag in the carrier through the CBRA inspection process if the carrier meets TSA requirements for the baggage inspection stations per Section 14.3. In this concept, it is usually necessary to provide storage lines for empty carriers (for use in off-peak periods when only a small number of carriers is needed). These empty carrier storage lines can also be used for storing early check-in bags to reduce the makeup cart/container requirement for the terminal.

B.4.2 Evaluation of Individual Carrier System-based CBIS Design Concept C

By keying the unique carrier number to bag identity, it is possible to accurately track bags and transfer images to TSA personnel in the CBRA. Bag orientation can also be maintained from the EDS unit to the inspection table. It is possible to subdivide the carrier distribution system in this concept into two or more independent but connected subsystems, so that a single point of failure condition can be avoided. This concept generally avoids the need for a separate sortation system downstream of the EDS/ETD screening area, and permits the same system to be used for both security screening purposes and for sorting bags by flight or by airline. In ICS-based design Concept C, it is relatively easy to add EDS units to accommodate future growth. In light of the complexity of the system, it is likely to be most suitable for a large installation of a complete baggage system in a new or extensively renovated terminal, for a major hub airline, or for a large terminal with multiple airlines sharing a common EDS screening facility.

APPENDIX C:

ALTERNATIVES ANALYSIS REPORT CASE STUDY

Oakland International Airport

Disclaimer: This case study follows the PGDS requirements and methodologies that were current at the time. While the overall process presented in the case study is consistent with PGDS v8 requirements, there have been substantial changes in the methodology for estimating demand (Section 5.5) and determining equipment requirements (Section 5.6). If using this case study as a process example, be sure to apply current requirements and methodologies.

C.1 Executive Summary

This case study focuses on the Port of Oakland's Alternatives Analysis to identify an optimally scaled checked baggage inspection system (CBIS) for Terminal 1 at Oakland International Airport (referred to in this case study as “the Airport”).

At the time this recent study was conducted, Terminal 1 served a mix of domestic airlines and their affiliated regional/commuter airlines, and the majority of bags were screened using explosives trace detection (ETD) instead of explosives detection system (EDS) machines. To improve customer service and support Airport growth opportunities, the Port was interested in evaluating in-line baggage screening alternatives. Key study objectives included: (1) minimizing the number of manual baggage screening inspections and (2) improving overall customer service at the Airport while screening 100% of checked bags.

Several conceptual alternatives for in-line screening, ranging from highly centralized systems with Type I EDS machines to more decentralized systems using lower-speed Type II EDS machines (a mini in-line CBIS), were considered.

As Terminal 1 was designed to serve a mix of domestic and international airlines, a high-throughput in-line CBIS was not feasible because of the spatial requirements and additional complexity associated with assigning bags to specific airlines after screening at a centralized location. Therefore, only four mini in-line CBIS alternatives were found to be operationally and spatially feasible for Terminal 1. For the mini in-line alternatives, Reveal CT-80 and L-3 eXaminer SX EDS machines were evaluated based on life-cycle cost, potential screening capacity, customer level of service, and other qualitative factors.

To support the evaluation, two models were developed. The first was a life-cycle-cost (LCC) model to determine the cost-effectiveness of each alternative over a 20-year period, and the second was a flow model to evaluate screening capacity, level of service, and operational performance.

After all constraints were evaluated, Alternative 3, a mini in-line system consisting of seven L-3 eXaminer SX EDS machines, was deemed to be the best CBIS alternative for Terminal 1 at the Airport.

C.2 Case Study Background

In spring 2004, the Port initiated a design study for the replacement of an existing baggage screening system using ETD technology with a set of automated EDS machines to serve Southwest Airlines (the sole airline tenant at the Airport's Terminal 2). The design concept called for a conveyor system to transfer baggage from ticket counters to an in-line EDS screening area adjacent to the terminal where EDS machines automatically screen baggage for explosives and divert false alarm and oversize baggage to a checked baggage resolution area (CBRA). Baggage cleared by the EDS machines proceeds to Southwest’s outbound baggage makeup carousel. The Terminal 2 in-line system became operational in February 2006; the in-line design study for that system is not included in this case study.

Terminal 1 serves a mix of domestic airlines and affiliated commuter operators. Currently, three EDS machines are used for screening checked baggage at Terminal 1.

United Airlines uses one stand-alone EDS machine (MD CTX 2500) located behind the airline ticket counter. Bags moving along the conveyor to the United Airlines' baggage makeup area are manually removed and sent through the EDS machine for security screening.

JetBlue Airways uses a semi-integrated EDS machine (MD CTX 5500) located behind the JetBlue ticket counter. A conveyor connects the ticket counters to the EDS machine. All JetBlue bags are first screened by the MD CTX 5500. Cleared bags are sent to the baggage makeup area and alarmed bags are sent to a CBRA, where alarms are resolved by Transportation System Administration (TSA) agents.

The remainder of the Terminal 1 airlines use manual ETD screening located in the baggage makeup rooms. In addition, bags that belong to passengers with a high-risk profile (referred to as "selectees") are manually carried to the third EDS machine (MD CTX 5500) located in the lobby, where they are screened, sorted, manually placed on the conveyor, and sent to the appropriate airline baggage makeup room.

The Airport is achieving 100% checked bag screening; however, the process is labor intensive, with the majority of the bags undergoing ETD screening instead of being screened by EDS machines. The Port wants to move ahead with an in-line EDS to improve customer service, scalability, and Airport growth opportunities.

Existing conditions at Terminal 1 are shown in Figure C.1.

Figure C.1: Existing Conditions, Terminal 1

C.3 CBIS Alternatives

C.3.1 Zoning Schemes

Checked baggage can be combined in the screening systems in several ways. Taking into consideration spatial and operational constraints, two zone hierarchy schemes were developed for Terminal 1.

For Terminal 1, the “F3 Zones” correspond to each baggage take-away belt, while the “F1 Zone” consists of the entire terminal. At the intermediate “F2 Zones,” several options are available to combine checked baggage into screening systems. For the purpose of this case study, two options were considered for F2 Zone groupings: Option A, shown in Figure C.2, divides the ticket counters into three groups combining checked baggage into three screening systems, while Option B, shown in Figure C.3, divides the ticket counters into two groups combining checked baggage into two screening systems.

Figure C.2: Zoning Schemes, Option A, Terminal 1

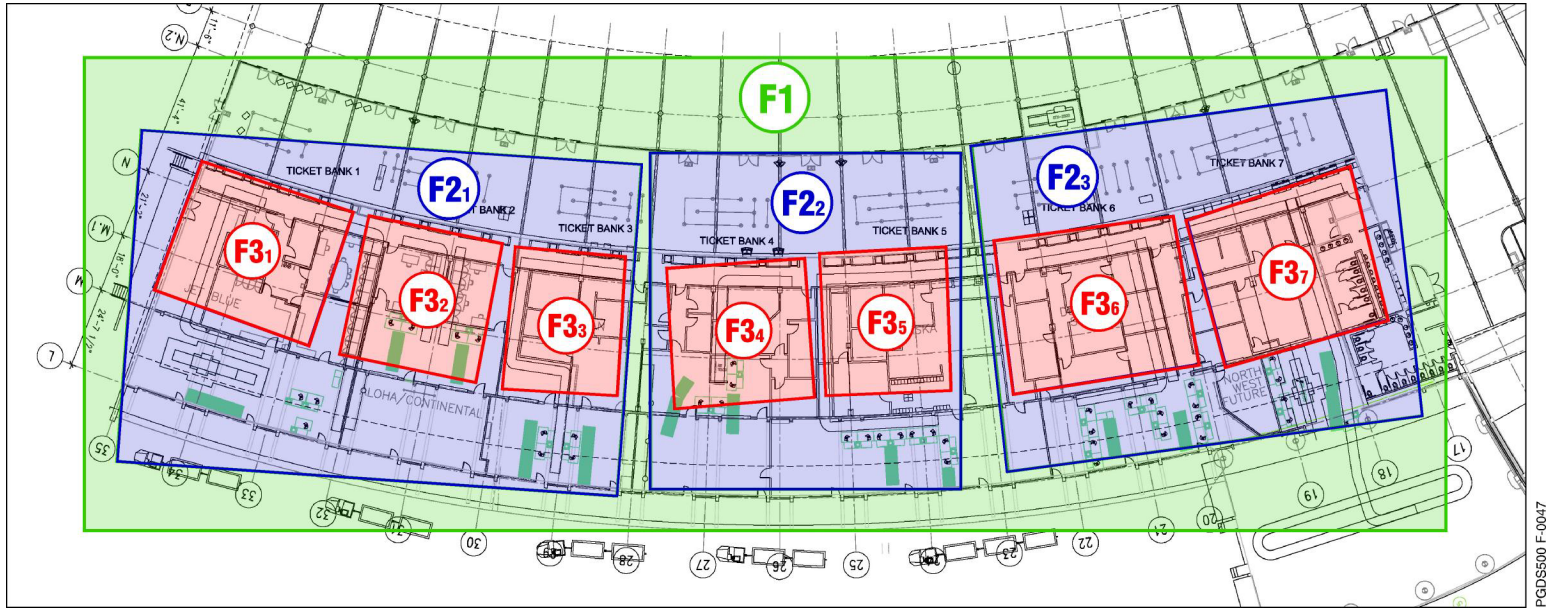
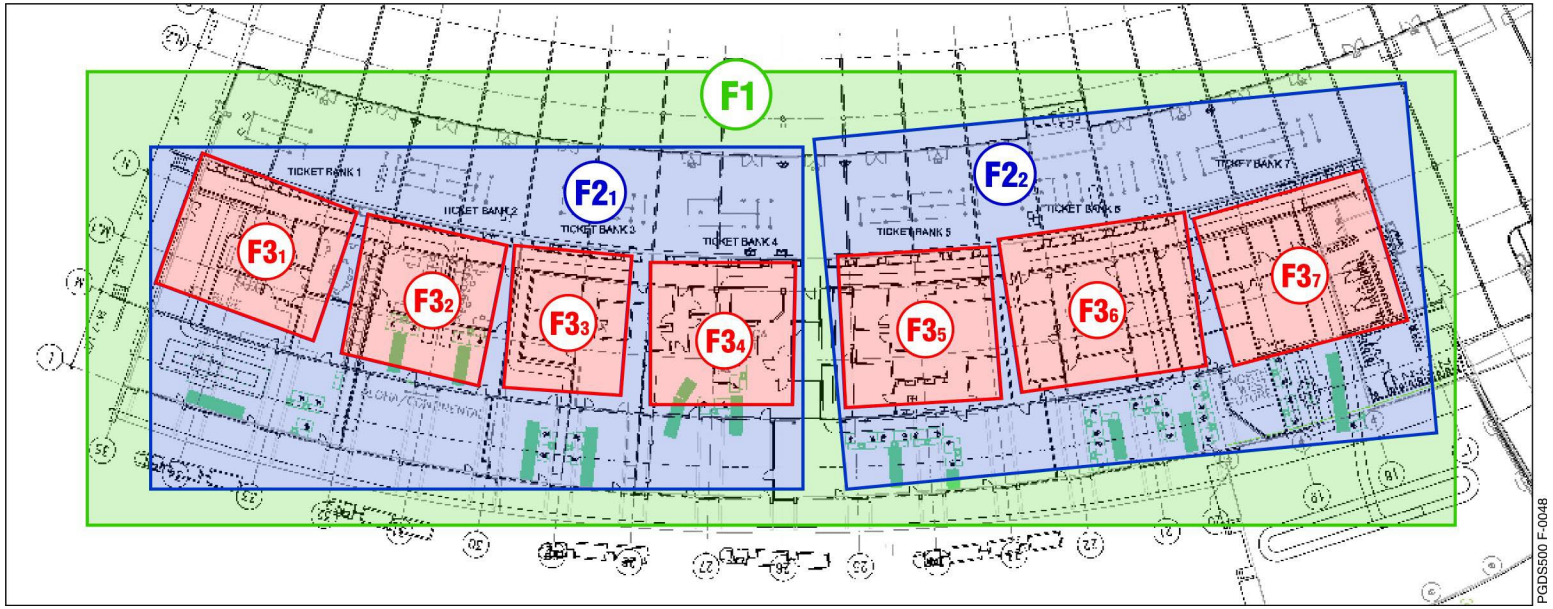


Figure C.3: Zoning Schemes, Option B, Terminal 1



C.3.2 Screening System Types

As explained in detail in Chapter 3, several system types and EDS equipment are available for in-line systems, ranging from highly centralized systems using High speed EDS machines to very decentralized systems using Low speed EDS machines. As the zoning schemes, the system type selection, and the estimated demand are interrelated, several iterations were necessary to determine an optimally scaled solution. Thus, at this early stage of analysis, all spatially feasible system options were considered and carried forward in the evaluation.

The following is a general description of potential system types for three zoning levels at Terminal 1 that were considered initial candidates for screening alternatives:

- **Terminal 1, F3 Zone Groupings** – Decentralized screening systems are recommended for F3 Zone groupings. Thus, at the F3 Zone level, mini in-line systems are acceptable options. Stand-alone EDS machines were not considered because they would present spatial constraints to any expansion that would be necessary to accommodate growth beyond the design year.

- **Terminal 1, F2 Zone Groupings** – At the F2 Zone level, depending on the expected checked baggage demand volumes, high-throughput centralized systems, such as in-line systems, or lower-throughput systems, such as mini in-line systems, are acceptable options.
- **Terminal 1, F1 Zone Grouping** – A centralized system is recommended at the F1 Zone level. Thus, both high-volume and medium-volume in-line systems are acceptable options for Terminal 1. The choice between high-volume and medium-volume system types depends on the date of beneficial use (DBU), since that will dictate the type of EDS equipment expected to be certified by that date. Since DBU is expected to be after 2008, both high-volume and medium-volume in-line systems would be viable. If a medium-volume system is ultimately selected, all necessary steps should be taken to make the system flexible enough to accommodate high-speed EDS machines when they become available.

C.3.3 Qualitative Assessment of Preliminary Alternatives

An initial assessment of a relatively large number of alternatives was performed and all alternatives that were clearly not feasible were immediately eliminated without further consideration. In this initial assessment, it was determined that structural and spatial constraints would render any expansion or major building modification required to accommodate the in-line systems cost prohibitive. Accordingly, at Terminal 1, all of the full in-line concepts were found to be infeasible. Only the mini-in-line system type layouts designed for the F3 Zone were found to be operationally and spatially feasible at Terminal 1.

For the F3 Zone alternatives, the Reveal CT-80 and L-3 eXaminer SX EDS machines were considered to be better options for the Airport compared to the L-3 eXaminer 3DX 6000 and MD CTX 5500 machines with ViewLink. The Reveal CT-80 and L-3 eXaminer SX machines are considered superior products because they are newer, have better performance capabilities, and have strong upgrade possibilities for the future. Therefore, the L-3 eXaminer 3DX 6000 and MD CTX 5500 with ViewLink were also eliminated from further consideration.

Table C.1 provides a list of all preliminary alternatives considered and brief reasons for rejecting the initial alternatives.

Table C.1: Initial Evaluation of Alternatives, Terminal 1

Zone	Option	System Type	Accepted or Rejected	Alternative name or reason for rejection
F3	Mini-In-Line	Reveal CT-80	Accepted	Alternative 1
F3	Mini-In-Line	L-3 eXaminer SX	Accepted	Alternatives 2 and 3
F3	Mini-In-Line	L-3 eXaminer 3DX 6000	Rejected	Inferior performance and limited upgrade opportunities
F3	Mini-In-Line	MD CTX 5500 (with View Link)	Rejected	Inferior performance and limited upgrade opportunities
F2	Mini-In-Line	Reveal CT-80	Rejected	Spatial constraints
F2	Mini-In-Line	L-3 eXaminer SX	Rejected	Spatial constraints
F2	Mini-In-Line	L-3 eXaminer 3DX 6000	Rejected	Spatial constraints
F2	Mini-In-Line	MD CTX 5500 (with View Link)	Rejected	Spatial constraints
F2	Medium Througput In-Line	MD CTX 9800 DSi	Rejected	Spatial constraints
F2	Medium Througput In-Line	L-3 eXaminer 3DX 6000	Rejected	Spatial constraints
F2	Medium Througput In-Line	L-3 eXaminer 3DX 6600	Rejected	Spatial constraints
F1	Medium Througput In-Line	MD CTX 9800 DSi	Rejected	Spatial constraints
F1	Medium Througput In-Line	L-3 eXaminer 3DX 6000	Rejected	Spatial constraints
F1	Medium Througput In-Line	L-3 eXaminer 3DX 6600	Rejected	Spatial constraints

C.3.4 Feasible Alternatives

The list of preliminary alternatives was reduced to three feasible alternatives based on F3 zoning and the following mini in-line system types. Each of the alternatives incorporates the same F3 zoning, i.e., the ticket counters are divided into seven ticket counter groups, one for each take-away belt, creating seven F3 Zones. These feasible alternatives are investigated further in the following sections.

- **Alternative 1:** Each F3 Zone is served by the required number of CT-80 EDS machines and one CBRA where the on-screen resolution (OSR) process is combined with ETD alarm resolution.
- **Alternative 2:** Each F3 Zone is served by the required number of in-line L-3 eXaminer SX machines. This alternative was split into two parts, Alternative 2a and Alternative 2b. Alternative 2a incorporates a combined OSR/ETD screening function, similar to Alternative 1. Alternative 2b incorporates dedicated OSR screening, which would be conducted in a separate screening room.
- **Alternative 3:** Each F3 Zone is served by the required number of in-line L-3 eXaminer SX machines. ETD screening and baggage makeup functions are partially consolidated as there would be a common CBRA and baggage makeup area for every two EDS machines.

In addition, OSR would be performed remotely, while ETD screening functions would be performed in the CBRA, as this more staff-efficient screening method can effectively be used when the CBIS design incorporates common use CBRAs.

C.4 Determination of Design Day Baggage Demand

Using the methodology outlined in Section 5.5, a baseline baggage demand is calculated from the most recent FDRS data or flight schedule data available. The data are used to identify the Current Demand and projected to the Design Year Demand, which is the DBU of the CBIS plus 5 years.

In this case study, flight schedules for 2006 were used for this analysis with a projected DBU of 2008 and subsequent DBU of 2013. In projecting future demand, the capacity of the functional components at the Airport must be considered. The ultimate terminal or Airport capacity should be treated as the upper limit for projected demand for the purposes of CBIS design.

Based on the Port's strategy for the Airport, it is unlikely that the capacity of Terminal 1 will be increased substantially in the foreseeable future. The reasons for this slowdown in growth at Terminal 1 include:

- The Terminal 2 expansion plan is under way and, once completed, all international flights and Southwest Airlines flights will be accommodated at Terminal 2 (making the current four Southwest gates at Terminal 1 available).
- It is expected that either a new entrant airline will begin service at Terminal 1 or a current airline located at Terminal 1 will expand at the Airport in subsequent years, requiring two of the four Terminal 1 gates currently used by Southwest. This new service is represented by flights of a fictitious future airline, “XX Airlines”.

Therefore, to ensure that the screening system alternatives were designed based on a realistic growth rate given the constraints on the terminal, two design days were considered, as described below. For this analysis, the entire Terminal 1 was treated as a single F1 screening zone.

- Standard methodology – This design day was constructed based on the FSA methodology outlined in Section 5.5.2.2 using design values that were current at the time of the calculations. The ADPM flight schedule for Terminal 1 was identified, and using the forecast growth rates in the then-current Federal Aviation Administration's (FAA’s) Terminal Area Forecast (TAF), increased to reflect 2013 passenger volumes (2013 is DBU+5 years for the proposed in-line system). According to the TAF, total enplaned passengers at the Airport are expected to grow from 7.12 million annual passengers (MAP) in 2006 to 9.90 MAP in 2013. This represents an average annual growth rate of 4.82%. Using this method, baggage flows for the ADPM were increased by 4.82% annually to 2013.
- Strategy-oriented methodology – This design day was constructed based on the Port’s future strategy that no additional gates will be built at Terminal 1 and that Southwest will move completely to Terminal 2. Two of the four vacated gates at Terminal 1 would be used by a future airline (XX Airlines). The remaining two gates could be used to accommodate growth of airlines currently serving the Airport. To properly reflect Terminal 1 capacity, the design day flight schedule was based on the 2006 peak day of the peak month (PDPM) flight

schedule. This schedule was sent to the airlines for verification, and new flights were added to the schedule in accordance with the airlines' requests. In line with the Port's strategy for the Airport, Southwest was eliminated from the flight schedule and was replaced by XX Airlines. The flight schedule for XX Airlines was based on Southwest's gating schedule for two of Southwest's four gates at Terminal 1. Gate utilization was analyzed based on gating information provided by Airport staff. For gates with low utilization, flights were added to create the design day flight schedule. Using this method, a design day flight schedule based on the detailed information provided by the airlines and Airport staff was created and baggage flows were generated from this flight schedule.

Determination of the ADPM and PDPM design day values were based on Terminal 1 flight schedules to determine the peak month (August) and the ADPM (August 26) and PDPM (August 25). Load factors, origin and destination (O&D) percentages, earliness distributions, and checked bags per passenger for those days were applied to the maximum seat capacities for the ADPM and PDPM flight schedules to arrive at the base ADPM and PDPM baggage flows.

Two design days were then created. The design days were based on the standard and strategy-oriented methodologies described above. One design day was created by increasing the ADPM baggage flows to 2013 levels based on the TAF growth rates (standard methodology). The other design day was created by using the PDPM flight schedule and adding flights based on the Port's future strategy (strategy-oriented methodology).

The following sections provide details of the design-day selection process.

C.4.1 Peak Month

Table C.2 shows the monthly totals and daily averages for all flights in Terminal 1 used to identify August as the peak month.

Table C.2: Terminal 1 Peak Month Available Seats 2007

Month	Monthly seats	Average daily seats
January	279,034	9,001
February	254,786	9,100
March	286,400	9,239
April	271,707	9,057
May	309,719	9,991
June	320,829	10,694
July	324,051	10,802
August	335,573	10,825
September	293,789	9,793
October	299,965	9,676
November	279,911	9,330
December	288,890	9,319

C.4.2 Terminal 1 ADPM and PDPM

The ADPM and PDPM were determined by analyzing the numbers of Terminal 1 daily seats calculated from the Official Airline Guide (OAG) flight schedules for the peak month (August). The day closest to the peak month's average daily load determines the ADPM. The day closest to the peak month's daily peak determines the PDPM. Table C.3 shows the average daily departing seats for all domestic Terminal 1 flights (excluding those of Southwest Airlines) obtained from the OAG and the variance from the monthly average for Terminal 1. This analysis determined that August 26 is the ADPM and that August 25 is the PDPM.

Table C.3: Average Day and Peak Day of the Peak Month: August 2006

Daily Available Seating
Average day seats: 10,387

Day	Available seats	Variance from average
1	10,368	-19
2	10,368	-19
3	10,368	-19
4	10,492	105
5	10,388	1
6	10,244	-143
7	10,492	105
8	10,368	-19
9	10,368	-19
10	10,368	-19
11	10,492	105
12	10,388	1
13	10,244	-143
14	10,492	105
15	10,368	-19
16	10,368	-19
17	10,368	-19
18	10,492	105
19	10,388	1
20	10,244	-143
21	10,492	105
22	10,368	-19
23	10,368	-19
24	10,368	-19
25	10,492	105
26	10,388	1
27	10,244	-143
28	10,492	105
29	10,368	-19
30	10,368	-19
31	10,368	-19

Notes:
1. August 25 is the PDPM.
2. August 26 is the ADPM. Source: Official Airline Guide.

The ADPM flight schedule is provided in Table C.4. This flight schedule was used in the standard methodology.

Table C.4: Oakland Terminal 1 ADPM Schedule

Published carrier	Operator	Flight number	Departure time	Destination	Aircraft type	Number of seats
AA	AA	1008	6:26	DFW	M80	136
AA	AA	1612	8:09	DFW	M80	136
AA	AA	1092	12:43	DFW	M80	136
AA	AA	2256	15:06	DFW	M80	136
AQ	AQ	473	8:00	OGG	73W	124
AQ	AQ	441	9:00	HNL	73W	124
AS	AS	372	6:40	SNA	734	144
AS	AS	355	9:05	SEA	734	144
AS	AS	340	12:17	SNA	734	144
AS	AS	346	13:40	SNA	734	144
AS	AS	365	16:17	PDX	734	144
AS	AS	541	17:10	SEA	734	144
AS	AS	446	17:20	SNA	734	144
AS	AS	459	20:15	SEA	734	144
AS	AS	321	21:14	PDX	734	144
AS	AS	351	6:00	SEA	739	172
AS	AS	343	7:55	SEA	739	172
AS	AS	573	10:01	SEA	739	172
AS	AS	85	15:33	SEA	739	172
AS	AS	378	18:55	SNA	73G	124
AS	AS	579	7:20	PDX	M80	140
AS	AS	357	12:24	SEA	M80	140
AS	QX	2468	9:10	PDX	CR7	70
AS	QX	2534	19:10	PDX	CR7	70
B6	B6	241	6:30	LGB	320	156
B6	B6	94	7:10	JFK	320	156
B6	B6	474	7:40	BOS	320	156
B6	B6	100	8:50	JFK	320	156
B6	B6	312	9:20	IAD	320	156

Published carrier	Operator	Flight number	Departure time	Destination	Aircraft type	Number of seats
B6	B6	472	10:05	BOS	320	156
B6	B6	96	11:05	JFK	320	156
B6	B6	302	12:05	IAD	320	156
B6	B6	102	13:30	JFK	320	156
B6	B6	247	13:30	LGB	320	156
B6	B6	82	15:30	JFK	320	156
B6	B6	253	17:25	LGB	320	156
B6	B6	317	19:20	LGB	320	156
B6	B6	249	20:30	LGB	320	156
B6	B6	110	21:35	JFK	320	156
B6	B6	476	22:35	BOS	320	156
B6	B6	318	22:45	IAD	320	156
B6	B6	270	23:30	FLL	320	156
CO	CO	284	0:20	IAH	733	124
CO	CO	758	6:30	IAH	738	155
CO	CO	231	12:14	IAH	739	167
DL	DL	800	7:10	ATL	738	150
DL	DL	494	12:05	ATL	738	150
DL	DL	709	22:30	ATL	738	150
DL	DL	715	13:20	SLC	M90	150
DL	OO	3796	6:15	SLC	CRJ	50
DL	OO	3957	9:41	SLC	CRJ	50
DL	OO	3998	16:02	SLC	CRJ	50
DL	OO	3928	18:30	SLC	CRJ	50
HP	HP	855	9:00	PHX	319	124
HP	HP	567	6:00	PHX	320	150
HP	HP	721	13:46	LAS	320	150
HP	HP	191	15:40	PHX	320	150
HP	HP	611	20:20	LAS	320	150
HP	HP	753	12:29	PHX	733	134
HP	YV	6617	9:25	PHX	CR9	80
HP	YV	6557	18:22	PHX	CR9	80

Published carrier	Operator	Flight number	Departure time	Destination	Aircraft type	Number of seats
TZ	TZ	4627	9:35	OGG	73H	175
TZ	TZ	4625	10:55	HNL	73H	175
TZ	TZ	4517	17:20	HNL	73H	175
TZ	TZ	4523	19:35	ITO	73H	175
UA	A296	6515	12:37	LAX	CRJ	49
UA	A296	6505	16:34	LAX	CRJ	49
UA	A296	6507	17:35	LAX	CRJ	49
UA	A296	6501	19:56	LAX	CRJ	49
UA	UA	1193	6:30	LAX	319	120
UA	UA	1230	13:50	ORD	319	120
UA	UA	388	22:55	IAD	319	120
UA	UA	644	23:00	ORD	319	120
UA	UA	1122	6:00	DEN	320	138
UA	UA	242	6:20	ORD	320	138
UA	UA	386	8:10	DEN	320	138
UA	UA	808	15:34	DEN	733	120
UA	UA	364	11:05	DEN	735	116
UA	UA	738	14:00	DEN	735	116
UA	UA	328	16:45	DEN	735	116

Source: Official Airline Guide.

The PDPM flight schedule is provided in Table C.5 below. Additional flights, as indicated in the table, were added to the PDPM based on the Port's future strategy for Terminal 1. Specifically, flights were added based on feedback from the airlines regarding their future flight strategies as well as flights for XX Airlines, the new entrant airline that would use two of Southwest Airlines' four vacated Terminal 1 gates.

Table C.5: Oakland Terminal 1 PDPM Schedule

Published carrier	Operator	Flight number	Departure time	Destination	Aircraft type	Number of seats	Added to PDPM
AA	AA	1008	6:26	DFW	M80	136	No
AA	AA	1612	8:09	DFW	M80	136	No
AA	AA	9992	10:00	DFW	M80	136	Yes
AA	AA	1092	12:43	DFW	M80	136	No
AA	AA	2256	15:06	DFW	M80	136	No
AA	AA	9993	17:00	DFW	M80	136	Yes

Published carrier	Operator	Flight number	Departure time	Destination	Aircraft type	Number of seats	Added to PDPM
AQ	AQ	473	8:00	OGG	73W	124	No
AQ	AQ	441	9:00	HNL	73W	124	No
AQ	AQ	477	10:40	KOA	73W	124	No
AS	AS	351	6:00	SEA	739	172	No
AS	AS	372	6:40	SNA	734	144	No
AS	AS	579	7:20	PDX	M80	140	No
AS	AS	343	7:55	SEA	739	172	No
AS	QX	2468	9:00	PDX	CR7	70	No
AS	AS	355	9:05	SEA	734	144	No
AS	AS	573	10:01	SEA	739	172	No
AS	AS	340	12:17	SNA	734	144	No
AS	AS	357	12:24	SEA	M80	140	No
AS	AS	346	13:40	SNA	734	144	No
AS	AS	9991	14:00	PDX	734	144	Yes
AS	AS	85	15:33	SEA	739	172	No
AS	QX	2409	16:10	SUN	DH4	74	No
AS	AS	365	16:17	PDX	734	144	No
AS	AS	541	17:10	SEA	734	144	No
AS	AS	446	17:20	SNA	734	144	No
AS	AS	378	18:55	SNA	73G	124	No
AS	QX	2534	19:10	PDX	CR7	70	No
AS	AS	459	20:15	SEA	734	144	No
AS	AS	9990	20:30	SNA	734	144	Yes
AS	AS	321	21:14	PDX	734	144	No
B6	B6	241	6:30	LGB	320	156	No
B6	B6	94	7:10	JFK	320	156	No
B6	B6	474	7:40	BOS	320	156	No
B6	B6	100	8:50	JFK	320	156	No
B6	B6	312	9:20	IAD	320	156	No
B6	B6	472	10:05	BOS	320	156	No
B6	B6	96	11:05	JFK	320	156	No
B6	B6	302	12:05	IAD	320	156	No

Published carrier	Operator	Flight number	Departure time	Destination	Aircraft type	Number of seats	Added to PDPM
B6	B6	102	13:30	JFK	320	156	No
B6	B6	247	13:30	LGB	320	156	No
B6	B6	82	15:30	JFK	320	156	No
B6	B6	253	17:25	LGB	320	156	No
B6	B6	317	19:20	LGB	320	156	No
B6	B6	249	20:30	LGB	320	156	No
B6	B6	110	21:35	JFK	320	156	No
B6	B6	476	22:35	BOS	320	156	No
B6	B6	318	22:45	IAD	320	156	No
B6	B6	270	23:30	FLL	320	156	No
CO	CO	284	0:20	IAH	CO 733	124	No
CO	CO	284	0:20	IAH	CO 733	124	No
CO	CO	758	6:30	IAH	CO 738	155	No
CO	CO	231	12:14	IAH	CO 739	167	No
DL	OO	3796	6:15	SLC	CRJ	50	No
DL	DL	800	7:10	ATL	738	150	No
DL	OO	3957	9:41	SLC	CRJ	50	No
DL	DL	9994	10:30	ATL	738	150	Yes
DL	DL	494	12:05	ATL	738	150	No
DL	DL	1743	13:20	SLC	M90	150	No
DL	DL	9995	16:00	ATL	738	150	Yes
DL	OO	3998	16:02	SLC	CRJ	50	No
DL	OO	3928	18:30	SLC	CRJ	50	No
DL	DL	709	22:30	ATL	738	150	No
HP	HP	567	6:00	PHX	320	150	No
HP	HP	381	7:40	SJD	733	134	No
HP	HP	855	9:00	PHX	319	124	No
HP	YV	6617	9:25	PHX	CR9	80	No
HP	HP	753	12:29	PHX	733	134	No
HP	HP	721	13:46	LAS	320	150	No
HP	HP	626	15:40	PHX	733	134	No
HP	YV	6557	18:22	PHX	CR9	80	No

Published carrier	Operator	Flight number	Departure time	Destination	Aircraft type	Number of seats	Added to PDPM
HP	HP	539	20:20	LAS	319	124	No
TZ	TZ	4627	9:35	OGG	73H	175	No
TZ	TZ	4625	10:55	HNL	73H	175	No
TZ	TZ	4517	17:20	HNL	73H	175	No
TZ	TZ	4523	19:35	ITO	73H	175	No
UA	UA	1122	6:00	DEN	UA 320	138	No
UA	UA	242	6:20	ORD	UA 320	138	No
UA	UA	281	7:30	IAD	UA 320	138	No
UA	UA	386	8:10	DEN	UA 320	138	No
UA	UA	9980	9:40	LAX	UA 733	137	Yes
UA	UA	9981	12:00	ORD	UA 73G	137	Yes
UA	A296	6515	12:37	LAX	CRJ	49	No
UA	UA	1230	13:50	ORD	UA 319	120	No
UA	UA	9982	14:50	LAX	UA 73G	137	Yes
UA	UA	808	15:34	DEN	UA 733	120	No
UA	UA	9983	16:20	ORD	UA 733	137	Yes
UA	A296	6505	16:34	LAX	CRJ	49	No
UA	A296	6507	17:35	LAX	CRJ	49	No
UA	A296	6501	19:56	LAX	CRJ	49	No
UA	UA	9996	22:00	ORD	UA 320	138	Yes
UA	UA	388	22:55	IAD	UA 319	120	Yes
XX	XX	398	6:05	SAN	73G	137	Yes
XX	XX	1380	6:30	LAX	733	137	Yes
XX	XX	825	6:55	ONT	73G	137	Yes
XX	XX	2432	7:25	BUR	733	137	Yes
XX	XX	1233	7:40	SAN	733	137	Yes
XX	XX	1474	7:40	RNO	733	137	Yes
XX	XX	1215	7:50	SEA	73G	137	Yes
XX	XX	997	9:00	MDW	73G	137	Yes
XX	XX	1726	9:35	BUR	733	137	Yes
XX	XX	493	11:00	LAX	733	137	Yes
XX	XX	622	11:10	BOI	733	137	Yes

Published carrier	Operator	Flight number	Departure time	Destination	Aircraft type	Number of seats	Added to PDPM
XX	XX	1409	11:35	LAS	733	137	Yes
XX	XX	1041	11:40	BUR	73G	137	Yes
XX	XX	1284	13:35	BUR	733	137	Yes
XX	XX	530	13:55	LAS	733	137	Yes
XX	XX	1790	14:40	ONT	73G	137	Yes
XX	XX	1385	16:00	LAX	733	137	Yes
XX	XX	907	17:30	LAX	73G	137	Yes
XX	XX	1853	17:35	SNA	73G	137	Yes
XX	XX	1055	18:10	ONT	733	137	Yes
XX	XX	1735	18:15	BUR	733	137	Yes
XX	XX	1381	19:20	SLC	733	137	Yes
XX	XX	1834	19:55	SAN	73G	137	Yes
XX	XX	1795	20:05	ONT	73G	137	Yes
XX	XX	1776	22:00	LAX	73G	137	Yes
XX	XX	530	13:55	LAS	733	137	Yes
XX	XX	1790	14:40	ONT	73G	137	Yes
XX	XX	1385	16:00	LAX	733	137	Yes
XX	XX	907	17:30	LAX	73G	137	Yes
XX	XX	1853	17:35	SNA	73G	137	Yes
XX	XX	1055	18:10	ONT	733	137	Yes
XX	XX	1735	18:15	BUR	733	137	Yes
XX	XX	1381	19:20	SLC	733	137	Yes
XX	XX	1834	19:55	SAN	73G	137	Yes
XX	XX	1795	20:05	ONT	73G	137	Yes
XX	XX	1776	22:00	LAX	73G	137	Yes

Source: Official Airline Guide.

C.5 Terminal 1 Demand Estimation

C.5.1 Design Load Adjustment Factors

Table C.6 summarizes the factors used to determine the baggage load profiles for each of the ADPM and PDPM flight schedules. Load factors and O&D percentages were directly obtained from the airlines for the month of August. Typical earliness distributions for the domestic airlines

were assumed and later confirmed by the airlines. The number of checked bags per passenger was provided by the airlines. If the airlines were unable to provide these data, then the data were derived from surveys conducted at the airport in summer 2002.

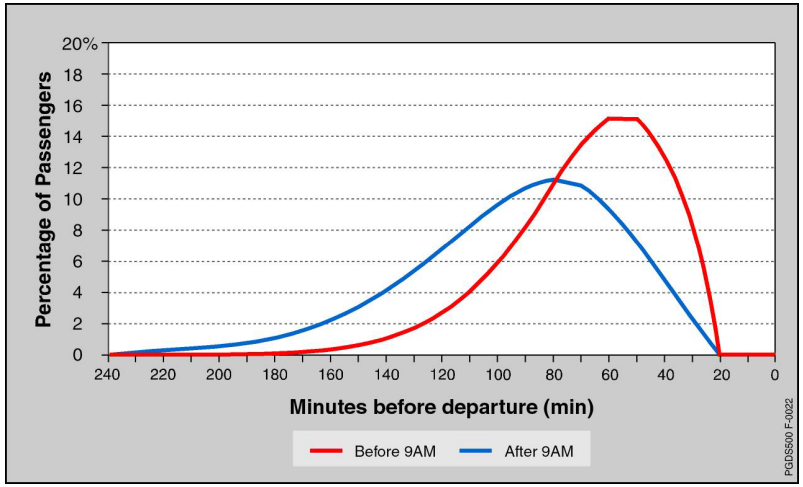
Table C.6: Design Load Adjustment Factor Per Airline

Operator name	Operator code	Load factor	Percent originating before 9 a.m.	Percent originating after 9 a.m.	Percent of parties checking pre-gate	Average number of checked bags per passenger
Continental Airlines	CO	96%	100%	100%	75%	0.79
Alaska Airlines	AS	98	100	100	80	0.71
America West Airlines (domestic destinations)	HP	83	100	100	84	0.68
United Airlines	UA	85	100	100	45	0.87
XX Airlines	XX	77	100	85	34	0.92
SkyWest Airlines	OO	91	100	100	79	0.91
American Airlines	AA	98	100	100	90	0.71
JetBlue Airways	B6	90	100	100	90	0.90
Delta Air Lines	DL	89	100	100	92	0.98
America West Airlines (Mexican destinations)	HP	83	100	100	100	1.30
Aloha Airlines	AQ	85	100	100	97	1.30
Horizon Air	QX	60	100	100	77	0.95
Mesa Airlines	YV	85	100	100	51	0.96
ATA Airlines	TZ	85	100	80	64	1.23
United Express/ SkyWest Airlines	A296	91	100	100	66	0.87

Based on discussions with Airport staff, 1% of all arriving bags were assumed to be out-of-gauge (OOG).

The passenger arrival profiles for the Terminal 1 design day in Figure C.4 below were used for passenger arrivals before 9:00 a.m. and after 9:00 a.m.

Figure C.4: Passenger Arrival Profiles



C.5.2 Base Demand Estimation

The baseline CBIS design loads were calculated every 10 minutes over the duration of the design day. A surge factor was calculated according to the methodology in the version of the PGDS that was current at the time of the analysis, and applied to the CBIS design load for each 10-minute time period.

C.5.3 Design Year Demand Estimation

Baggage load profiles for Terminal 1 are provided below. The baggage load profiles calculated using the standard methodology and strategy-oriented methodology are provided in Figure C.5 and Figure C.6, respectively.

Figure C.5: Standard Methodology Design Load Profile

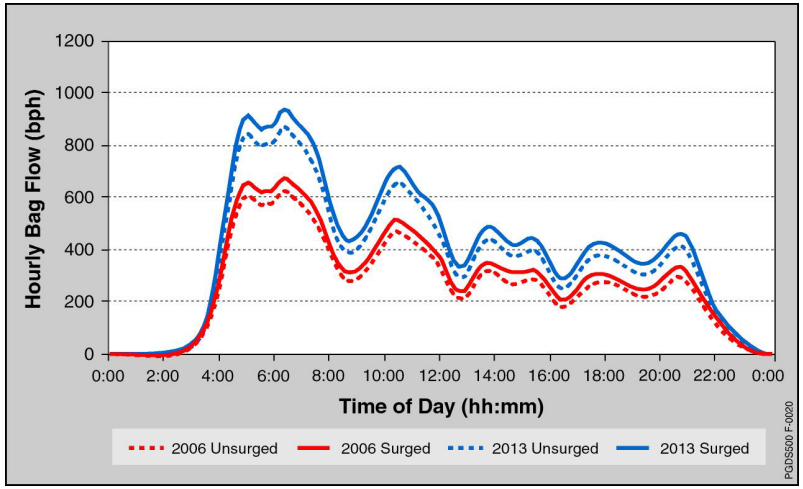
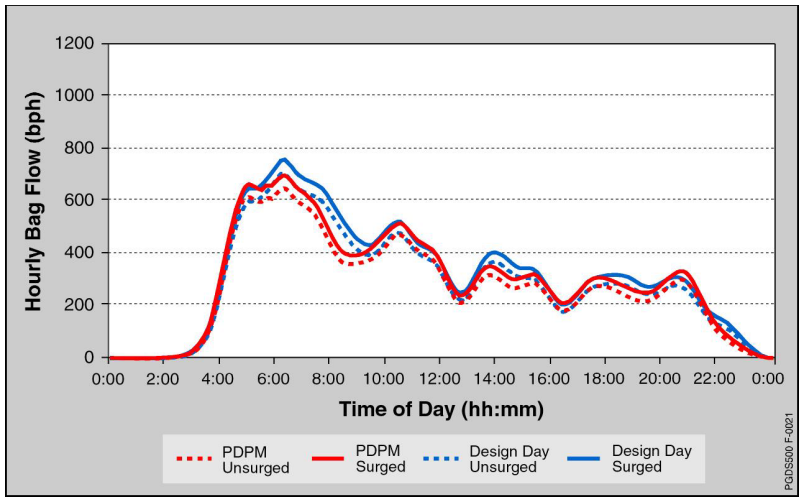


Figure C.6: Strategy-Oriented Methodology Design Load Profile



A comparison of the two design day baggage flows for Terminal 1 is provided in Table C.7 below.

Table C.7: Comparison of Design Day Peak Hour Baggage Flows at Terminal 1

ADPM (8/26/06)	Standard Methodology Design Day 2013 ADPM	PDPM (8/25/06)	Strategy-Oriented Methodology Design Day
675 bph	938 bph	701 bph	760 bph

Notes:
1. Southwest currently uses its own in-line system located at Terminal 2. Therefore, southwest flights were eliminated from all baggage flow calculations.
2. The ADPM and PDPM flight schedules used in this analysis were based on OAG data for March 2006 and could vary from the actual schedules that occurred on those days.

C.5.4 Terminal 1 Design Day Baggage Demand

As Table C.7 illustrates, the peak hour baggage flows of the PDPM (701 bags) and ADPM (675 bags) were very similar. The strategy-oriented methodology increased the peak hour baggage flow by 8% from the PDPM, while the peak hour baggage flows calculated using the standard methodology grew by 39%. A 39% increase in the predicted peak hour baggage flow is considered to be very aggressive given the operational constraints of the airlines at Terminal 1.

Based on the above findings and further consultation with Airport staff, the strategy-oriented design day based on the Port's future strategy for the Airport was selected as the preferred design day. This design day is used throughout the remainder of this case study.

The design day accepted by the Port is summarized as follows:

- 116 departing operations
- 15,585 departing seats
- 12 gates available (approximately 10 daily turns per gate)

This method for estimating baggage demand differs from the standard methodology described in Section 5.2 and is included here as an example illustrating that an alternative method can be used if there is sufficient rationale for doing so. The rationale in this case was based on two key observations. The first observation is that the high gate utilization indicates that the terminal is currently operating at or near maximum capacity. The second observation is that site constraints limit future gate expansion to two gates. The schedule that was developed represents a reasonable estimate of the maximum demand that the terminal could accommodate. When using a demand estimation methodology different from that described in Section 5.2, justification must be provided to TSA. TSA must review and approve the method and results before design can proceed.

C.6 Quantitative Assessment

C.6.1 Baseline Demand Estimation

Existing checked baggage screening flows were estimated for each of the seven F3 screening zones. The F3 screening zones and CBRA were the same for feasible Alternatives 1 and 2. Alternative 3 combines ticket counter groups into common CBRAs. However, each ticket counter group still feeds its own EDS scanner. Therefore, the baseline demand and design day peak hour surged baggage volume calculations to determine the required number of EDS machines for each F3 Zone (ticket counter group) are applicable to all of the feasible alternatives.

C.6.1.1 List of Airlines

Table C.8 lists Terminal 1 airlines by screening zone. The F1 and F2 Zone groupings have been eliminated, as all F1 and F2 alternatives were deemed spatially infeasible during the initial assessment of alternatives described in Section C.3.4 above.

Table C.8: Comparison of Design Day Baggage Flows at Terminal 1

Zone	Airlines
$F3_1$	B6 - JetBlue Airways
$F3_2$	AQ - Aloha Airlines CO - Continental Airlines
$F3_3$	AA - American Airlines
$F3_4$	HP - America West Airlines YV - Mesa Airlines US - US Airways
$F3_5$	AS - Alaska Airlines QX - Horizon Air
$F3_6$	DL - Delta Air Lines OO - SkyWest Airlines TZ - ATA Airlines
$F3_7$	UA - United Airlines A296 - United Express XX - New Entrant Airline

Notes: 1. Refer to Figure C.2 for locations of screening zones.
2. Assumed new entrant airline using currently occupied gates that will be available after completion of the Terminal 2 expansion

C.6.2 Design Day Demand Estimation

Figure C.7 through Figure C.13 below are the CBIS design load graphs for the $F3_1$ through $F3_7$ screening zones based on the strategy-oriented methodology. The base year CBIS design loads were calculated every 10 minutes over the duration of the design day. A surge factor was calculated to the methodology at the time and was applied to the CBIS design load of each 10-minute period.

Figure C.7: Strategy-Oriented Methodology Design Load Profile, $F3_1$ Zone

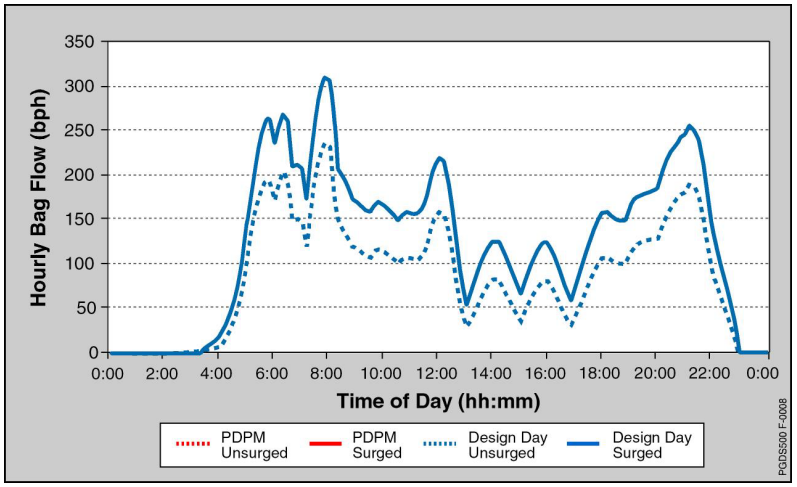


Figure C.8: Strategy-Oriented Methodology Design Load Profile, $F3_2$ Zone

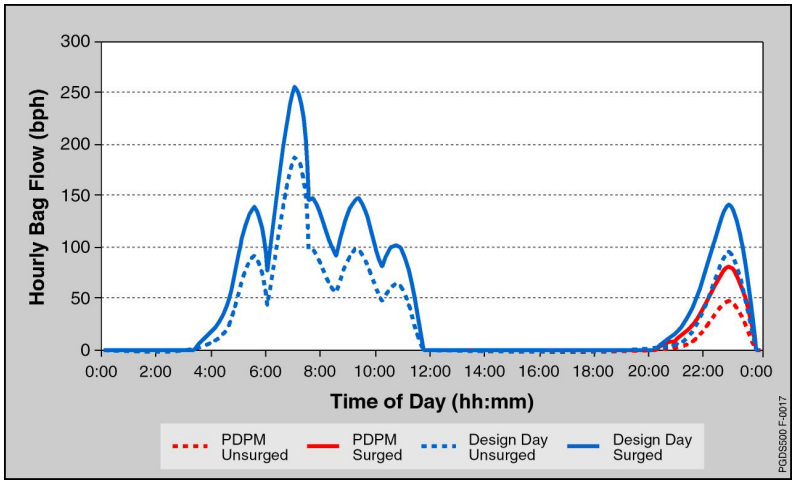


Figure C.9: Strategy-Oriented Methodology Design Load Profile, $F3_3$ Zone

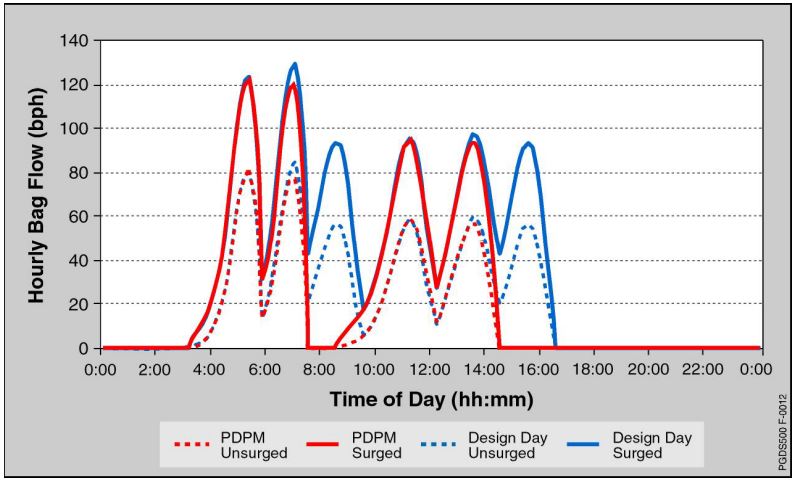


Figure C.10: Strategy-Oriented Methodology Design Load Profile, $F3_4$ Zone

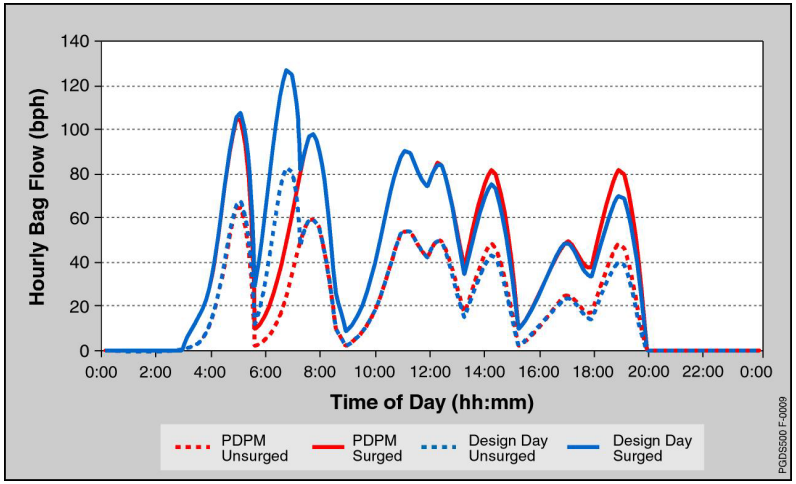


Figure C.11: Strategy-Oriented Methodology Design Load Profile, $F3_5$ Zone

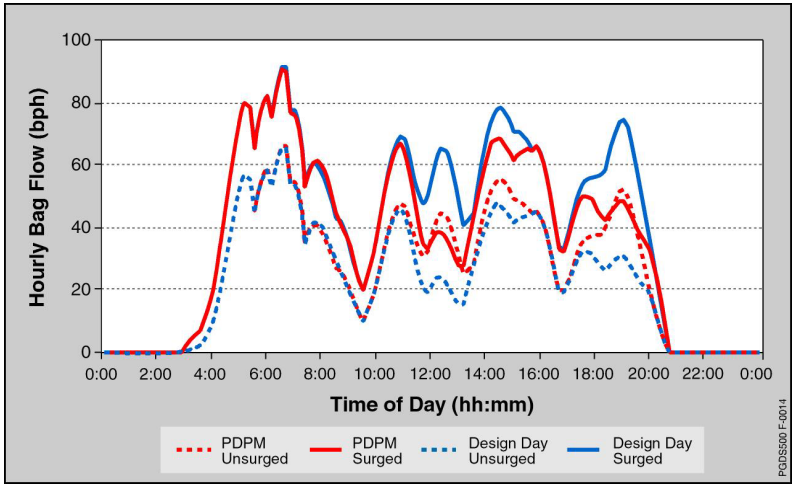


Figure C.12: Strategy-Orientated Methodology Design Load Profile, $F3_6$ Zone

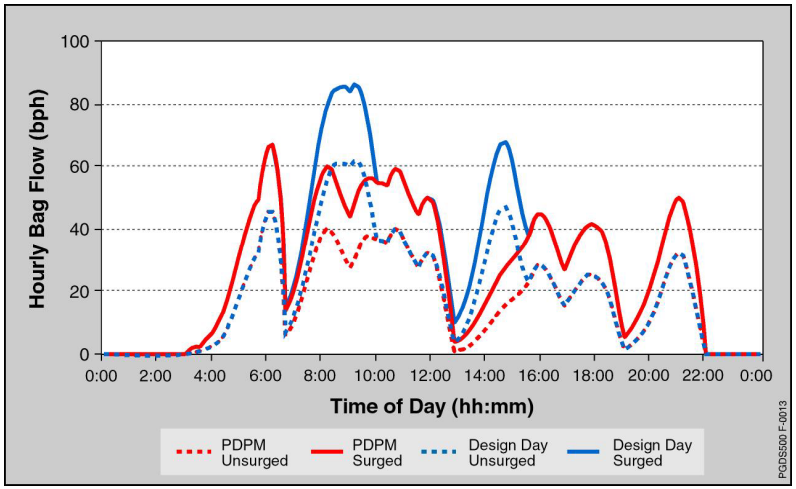


Figure C.13: Strategy-Orientated Methodology Design Load Profile, $F3_7$ Zone

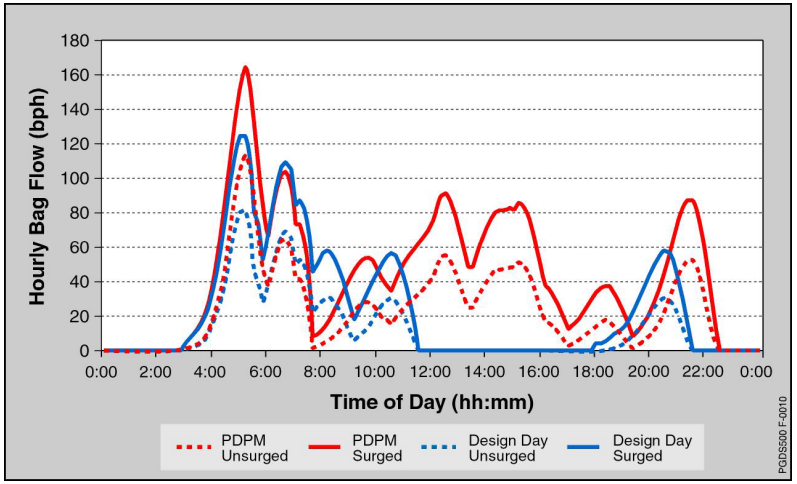


Table C.10 summarizes the PDPM (2008), PDPM surged, and design day and design day surged peak hour baggage volumes for each of the F3 screening zones.

Table C.10: F3 Screening Zone Peak Hour Baggage Volumes

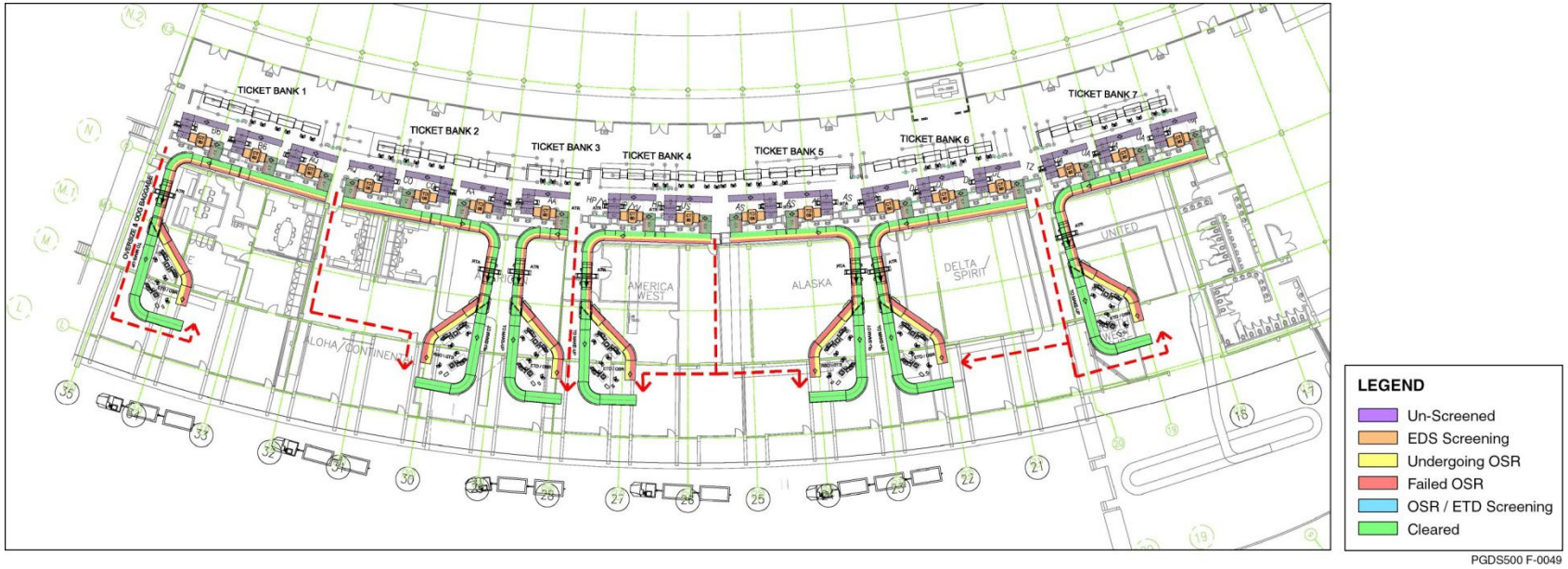
Zone	Airlines	PDPM	Peak Hour Baggage Volume PDPM Surged	Peak Hour Baggage Volume Design Day	Design Day Surged
$F3_1$	B6 - JetBlue Airways	236	311	236	311
$F3_2$	AQ - Aloha Airlines CO - Continental Airlines	188	256	188	256
$F3_3$	AA - American Airlines	80	123	84	129
$F3_4$	HP - America West Airlines YV - Mesa Airlines US - US Airways	65	105	161	224
$F3_5$	AS - Alaska Airlines QX - Horizon Air	164	227	166	229
$F3_6$	DL - Delta Air Lines OO - SkyWest Airlines TZ - ATA Airlines	114	166	154	215
$F3_7$	UA - United Airlines A296 - United Express XX - New Entrant Airline	113	165	186	253

Using the surged peak hour design day baggage volume, EDS, OSR, and ETD equipment requirements can be calculated for each of the three feasible alternatives based on the high-level methodology described in the following paragraphs. Note that the methodology for determining equipment requirements in Section 5.6 of PGDS v8 is very different from the older methodology in this case study.

C.6.3 Feasible Alternative 1 – CT-80 EDS Machines

This alternative is a conceptual layout for the F3 Zone grouping at Terminal 1. Under this alternative, 17 Reveal CT-80 EDS machines would be placed directly behind and parallel to the ticket counters. The ticket counters would be divided into seven groups (F3 Zone grouping). Each group would be served by one, two, or three EDS machines and one CBRA, where combined OSR and ETD screening functions would be performed. Each grouping of machines would have a single conveyor leading to the baggage makeup area and the CBRA. The differences between dedicated and combined OSR functionality would be investigated further if Alternative 1 were selected as a preferred alternative; however, given the highly decentralized nature of this alternative, combined OSR/ETD is likely to be the most cost-effective approach. A conceptual diagram of Alternative 1 is provided in Figure C.14.

Figure C.14: Alternative 1 Conceptual Diagram, Terminal 1



C.6.3.1 EDS Screening Equipment

Alternative 1 is based on the use of Reveal CT-80 EDS machines. The use of CT-80 EDS machines in a mini in-line system yields a throughput of 120 bags per hour (bph). The peak-hour surged baggage volume is divided by the assumed EDS equipment throughput, yielding the quantity of required EDS machines. The number of required EDS machines is rounded up.

As discussed in previous paragraphs, activity at Terminal 1 is constrained by the number of gates and the design year activity was projected based on this constraint; therefore, additional growth beyond the projected design year levels would not be possible. For this reason, the system would not need additional flexibility to accommodate growth beyond the design year. Given the decentralized nature of Terminal 1 mini in-line systems, redundancy would be provided through the use of nearby systems. While the demand profiles indicate that peaks generally occur early in the morning, some of the EDS machines are not fully utilized and could offer spare capacity if needed.

Redundant equipment is only cost-effective for high-throughput and medium-throughput in-line systems, where machine downtime can have a significant effect on system performance because of the high throughput of each EDS machine.

Table C.11 indicates the number of EDS machines required for Alternative 1.

Table C.11: Alternative 1 EDS Machine Capacity Calculations

Zone	Airlines	Peak Hour Bag Volume	EDS Throughput (bags/hour)	# EDS	# EDS With Redundancy
$F3_1$	B6 - JetBlue Airways	311	120	3	Same
$F3_2$	AQ - Aloha Airlines CO - Continental Airlines	256	120	3	Same
$F3_3$	AA - American Airlines	129	120	2	Same
$F3_4$	HP - America West Airlines YV - Mesa Airlines US - US Airways	224	120	2	Same
$F3_5$	AS - Alaska Airlines QX - Horizon Air	229	120	2	Same
$F3_6$	DL - Delta Air Lines OO - SkyWest Airlines TZ - ATA Airlines	215	120	2	Same
$F3_7$	UA - United Airlines A296 - United Express XX - New Entrant Airline	253	120	3	Same

C.6.3.2 OSR/ETD Screening Equipment

ETD-Screened Baggage: As a mini in-line system, Alternative 1 is based on the use of OSR and ETD screening functions combined and performed by the same ETD screener with individual CBRAs dedicated to each screening zone or system. In general, an ETD machine would be shared between two screeners. Thus, the ratio of ETD screening stations to ETD equipment was assumed to be 2 to 1.

The formula for used to calculate the combined OSR and ETD station requirements is explained below. Please note that the values used in these calculations are based on the equipment assumptions applicable at the time of the analysis. The calculation for screening zone $F3_1$ is shown below. Similar calculations were performed for the other six screening zones.

NOTE: All EDS false alarm rates and OSR clear rates are notional and are used for this example only. False alarm rates are considered SSI and can be requested from TSA, along with OSR clear rates.

The number of combined OSR and ETD screening stations required for zone $F3_1$:

$$N_{ETD\ Stations} = (\text{Sum of Throughput}_{EDS} \times FA_{EDS}) \div (\text{Throughput}_{OSR/ETD\ Screener})$$
$$= (360\ \text{bph} \times 19.5\%) \div 34.5\ \text{bph}$$
$$= 2.03 \rightarrow 3\ (\text{rounded up})$$
$$N_{ETD\ Machines} = (N_{ETD}\ \text{Stations} \div 2)\ \text{rounded up to the next ETD}$$
$$= (3 \div 2)$$
$$= 1.5 \rightarrow 2\ (\text{rounded up})$$

Table C.12 indicates the quantity of combined OSR/ETD stations and ETD machines required for Alternative 1.

Table C.12: Alternative 1 OSR/ETD Equipment Calculations

Zone	Airlines	Peak Hour Bag Volume	EDS Throughput (bags/hour)	# EDS	# EDS With Redundancy	Number of combined OSR/ETD stations	Number of ETD machines
$F3_1$	B6 - JetBlue Airways	311	120	3	Same	3	2
$F3_2$	AQ - Aloha Airlines CO - Continental Airlines	256	120	3	Same	3	2
$F3_3$	AA - American Airlines	129	120	2	Same	2	1
$F3_4$	HP - America West Airlines YV - Mesa Airlines US - US Airways	224	120	2	Same	2	1
$F3_5$	AS - Alaska Airlines QX - Horizon Air	229	120	2	Same	2	1
$F3_6$	DL - Delta Air Lines OO - SkyWest Airlines TZ - ATA Airlines	215	120	2	Same	2	1
$F3_7$	UA - United Airlines A296 - United Express XX - New Entrant Airline	253	120	3	Same	3	2

Oversize and OOG Baggage: Based on discussions with Airport staff and analysis of the CT-80 and L-3 eXaminer SX design specifications, it was assumed that 1% of all checked baggage at Terminal 1 is either oversize or OOG. These bags would be manually carried by the ticketing agent to the opposite end of the CBIS and given to TSA agents working at the ETD stations for directed trace screening.

C.6.4 Feasible Alternative 2 – L-3 eXaminer SX EDS Machines

This alternative is a conceptual design for the F3 Zone grouping at Terminal 1. As shown in Figure C.15, seven L-3 eXaminer SX EDS machines would be used under this alternative. The ticket counters would be divided into the same seven ticket counter groups as under Alternative 1. However, each group would be served by one EDS machine integrated downstream of the ticket counter take-away conveyor. This alternative was further split into two parts, Alternative 2A and Alternative 2B. Under Alternative 2A, OSR and ETD screening functions would be combined, similar to Alternative 1. Under Alternative 2B, dedicated OSR screening would be conducted in a separate screening room. The conceptual diagrams for Alternative 2A and Alternative 2B are the same, except for the remote OSR room, which is already built as part of the existing in-line system in Terminal 2.

Figure C.15: Alternatives 2A and 2B Conceptual Diagram, Terminal 1

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C.6.4.1 EDS Screening Equipment

Alternatives 2 and 3 are based on the use of L-3 eXaminer SX EDS machines. As each ticket counter line under both alternatives would feed an EDS scanner, the EDS equipment requirements would be the same under both alternatives. The use of L-3 eXaminer SX EDS machines in a mini

in-line system yields a throughput of 350 bags per hour per machine. The peak-hour surged baggage volume is divided by the assumed EDS equipment throughput, yielding the quantity of required EDS machines. In accordance with the PGDS, machine requirements should be rounded up to the next whole EDS machine exclusive of redundancy considerations.

Given the decentralized nature of the Terminal 1 mini in-line systems, redundancy would be provided through the use of nearby systems. While the demand profiles indicate that peaks generally occur early in the morning, some of the EDS machines are not fully utilized and could offer spare capacity if needed.

Redundant equipment is only cost-effective for high-throughput and medium-throughput in-line systems, where machine downtime can have a significant effect on system performance because of the high speed of each EDS machine.

Table C.13 indicates the quantity of EDS machines that would be required for Alternatives 2 and 3.

Table C.13: Alternatives 2 and 3 EDS Machine Calculations

Zone	Airlines	Peak Hour Bag Volume	EDS Throughput (bags/hour)	# EDS	# EDS With Redundancy
$F3_1$	B6 - JetBlue Airways	311	350	1	Same
$F3_2$	AQ - Aloha Airlines CO - Continental Airlines	256	350	1	Same
$F3_3$	AA - American Airlines	129	350	1	Same
$F3_4$	HP - America West Airlines YV - Mesa Airlines US - US Airways	224	350	1	Same
$F3_5$	AS - Alaska Airlines QX - Horizon Air	229	350	1	Same
$F3_6$	DL - Delta Air Lines OO - SkyWest Airlines TZ - ATA Airlines	215	350	1	Same
$F3_7$	UA - United Airlines A296 - United Express XX - New Entrant Airline	253	350	1	Same

C.6.4.2 OSR and ETD Screening Equipment

Alternative 2A, Combined OSR/ETD

As a mini in-line system, Alternative 2A is based on combined OSR and ETD screening functions that would be performed by the same ETD screener, with individual CBRAs dedicated to each screening zone or system. In general, an ETD machine would be shared between two screeners. Thus, the ratio of ETD screening stations to ETD equipment was assumed to be 2 to 1.

The formula for calculating the combined OSR and ETD station requirements is explained below. Please note that all of the values used in these calculations are based on the equipment assumptions applicable at the time of the analysis. False alarm rates are considered SSI and can be requested from TSA. The calculation for screening zone $F3_1$ is shown below. Similar calculations were performed for the other six screening zones.

The number of combined OSR and ETD screening stations required for zone $F3_1$:

$$N_{ETD\ Stations} = (N_{EDS}\ Throughput_{EDS} \times FA_{EDS}) \div (Throughput_{OSR/ETD\ Screener})$$
$$= (350\ bph \times 15\%) \div 45.3\ bph$$
$$= 1.16 \rightarrow 2\ (rounded\ up)$$
$$N_{ETD\ Machines} = (N_{ETD}\ Stations \div 2)\ rounded\ up\ to\ the\ next\ ETD$$
$$= (2 \div 2)$$
$$= 1\ ETD\ Machines$$

Alternative 2B, Dedicated OSR Screening

As a mini in-line system, Alternative 2B is based on the use of dedicated OSR and ETD screening functions that would be performed by different screeners, with individual CBRAs dedicated to each screening zone or system. In general, an ETD machine would be shared between two screeners. Thus, the ratio of ETD screening stations to ETD equipment was assumed to be 2 to 1.

The formula for calculating dedicated OSR and ETD station requirements is explained below. Please note that the values used in these calculations are based on the equipment assumptions applicable at the time of the analysis. The calculation for screening zone $F3_1$ is shown below. Similar calculations were performed for the other six screening zones.

NOTE: All EDS false alarm rates and OSR clear rates are notional and used for this example only. False alarm rates are considered SSI and, along with OSR clear rates, can be requested from TSA.

The number of separate OSR and ETD screening stations required:

$$N_{OSR} = (N_{EDS} \times Throughput_{EDS} \times FA_{EDS}) \div (Throughput_{OSR})$$
$$= (350 \text{ bph} \times 15\%) \div 180 \text{ bph})$$
$$= 0.16 \rightarrow 1 \text{ (rounded up)}$$
$$N_{ETD\ Stations} = (N_{EDS} \times Throughput_{EDS} \times FA_{EDS} \times (1\text{-}CR_{OSR})) \div (Throughput_{ETD\ Screener})$$
$$= (350 \text{ bph} \times 15\% \times 40\%) \div 24.2 \text{ bph}$$
$$= 0.87 \rightarrow 1 \text{ (rounded up)}$$

Table C.14 indicates the quantity of combined OSR/ETD stations and ETD machines that would be required for Alternative 2.

Table C.14: Alternative 2 OSR/ETD Equipment Calculations

Airlines	Peak Hour Bag Volume	EDS Throughput (bags/hour)	# EDS	# EDS With Redundancy	Alt. 2A # Combined OSR/ETD Stations	Alt. 2B # Separate OSR Machines	Alt. 2B # Separate ETD Machines
B6 - JetBlue Airways	311	350	1	Same	2	1	1
AQ - Aloha Airlines CO - Continental Airlines	256	350	1	Same	2	1	1
AA - American Airlines	129	350	1	Same	2	1	1
HP - America West Airlines YV - Mesa Airlines US - US Airways	224	350	1	Same	2	1	1
AS - Alaska Airlines QX - Horizon Air	229	350	1	Same	2	1	1
DL - Delta Air Lines OO - SkyWest Airlines TZ - ATA Airlines	215	350	1	Same	2	1	1
UA - United Airlines A296 - United Express XX - New Entrant Airline	253	350	1	Same	2	1	1

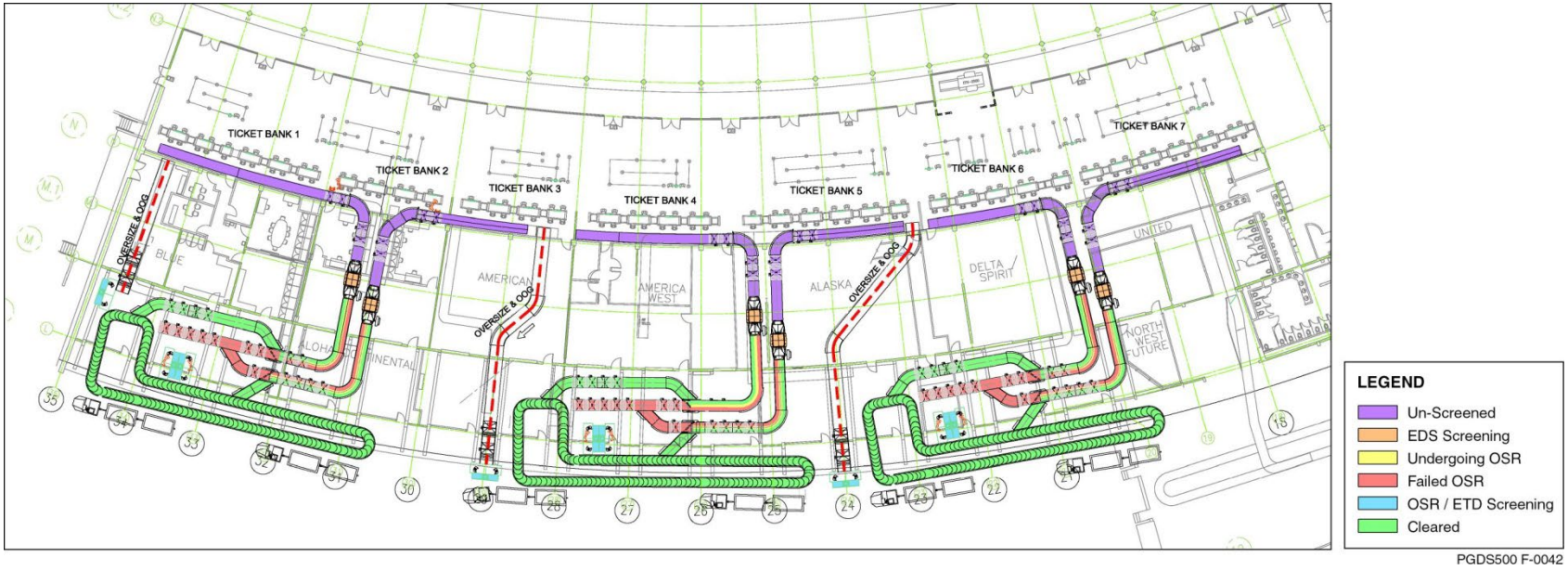
ETD Screening for Oversize and Out of Gauge Baggage

Based on discussions with Airport staff and analysis of the CT-80 and L-3 eXaminer SX design specifications, it was assumed that 1% of all checked baggage at Terminal 1 is either oversize or OOG. These bags would be manually carried by the ticketing agent to the opposite end of the CBIS and given to TSA agents working at the ETD stations for directed trace screening.

C.6.5 Feasible Alternative 3 – L-3 eXaminer SX EDS Machines

This alternative is also a conceptual design for the F3 Zone grouping at Terminal 1. Seven L-3 eXaminer SX EDS machines would be used. The ticket counters would be divided into seven ticket counter groups. Each group would be served by a single EDS machine integrated downstream of the ticket counter take-away conveyor. ETD screening and baggage makeup functions would be partially consolidated because a common CBRA and makeup area would serve every two EDS machines. In addition, OSR would be performed remotely, while ETD screening functions would be performed in the CBRA, as Alternative 3 represents a more staff-efficient screening method that could be effectively used when the CBIS design calls for common use CBRAs. A conceptual diagram of Alternative 3 is provided in Figure C.16.

Figure C.16: Alternative 3 Conceptual Diagram, Terminal 1



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C.6.5.1 Baseline Demand for Combined CBRAs

Surged PDPM for the Combined CBRAs

Alternative 3 combines ticket counter groups into common CBRAs for OSR and ETD screening. There are currently three common CBRAs consisting of screening zones $F3_{1-3}$, $F3_{4-5}$, and $F3_{6-7}$. To accurately calculate the design day peak baggage flow that would reach the common CBRAs, separate baseline demand and peak day demand calculations must be run based on the combined airline and flight schedules for each common CBRA.

The peak month and the ADPM for each CBRA zone should be calculated if the standard methodology is used, as shown in Table C.15. However, as the strategy-oriented methodology was used, wherein the design day was created based on feedback from the airlines, this approach would not apply.

Table C.15: Combined CBRAs Peak Month and Peak Day

Zone	Airlines	Peak month	Peak day
$F3_{1-3}$	B6 - JetBlue Airways AQ - Aloha Airlines CO - Continental Airlines AA - American Airlines	August	25
$F3_{4-5}$	HP - America West Airlines YV - Mesa Airlines US - US Airways AS - Alaska Airlines QX - Horizon Air	August	25
$F3_{6-7}$	DL - Delta Air Lines OO - SkyWest Airlines TZ - ATA Airlines UA - United Airlines A296 - United Express XX - New Entrant Airline	August	25

The Terminal 1 design load adjustment factors and rates identified earlier in Table C.6and the passenger arrival profiles identified in Figure C.4 were applied to the maximum seat capacity identified in each of the PDPM flight schedules for each of the combined CBRA zones.

Design Day Demand Estimation for Combined CBRA

Figure C.17 through Figure C.19 below represent the CBIS design load graphs for the $F3_{1-3}$, $F3_{4-5}$, and $F3_{6-7}$ screening zones. The base year CBIS design loads were calculated every 10 minutes over the duration of the design day. A surge factor was calculated according to the methodology at the time of the analysis and applied to the CBIS design load of each 10-minute period. These 10-minute results are shown graphically in the following charts.

Figure C.17: Strategy-Oriented Methodology Design Load Profile, $F3_{1-3}$ Zone

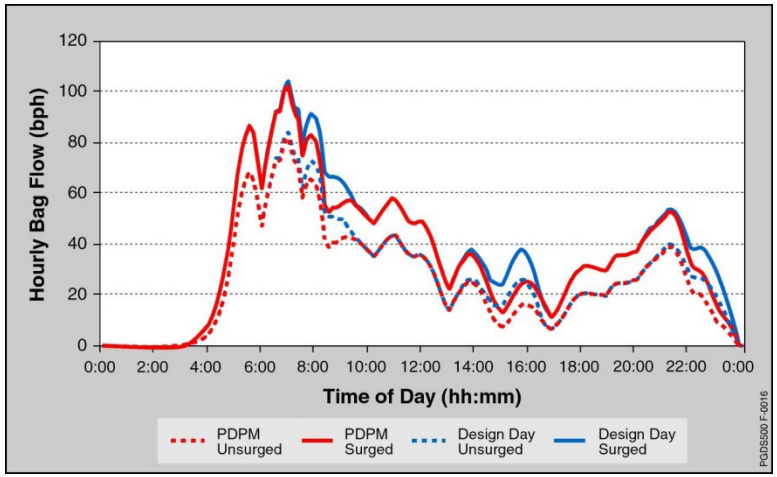


Figure C.18: Strategy-Oriented Methodology Design Load Profile, $F3_{4-5}$ Zone

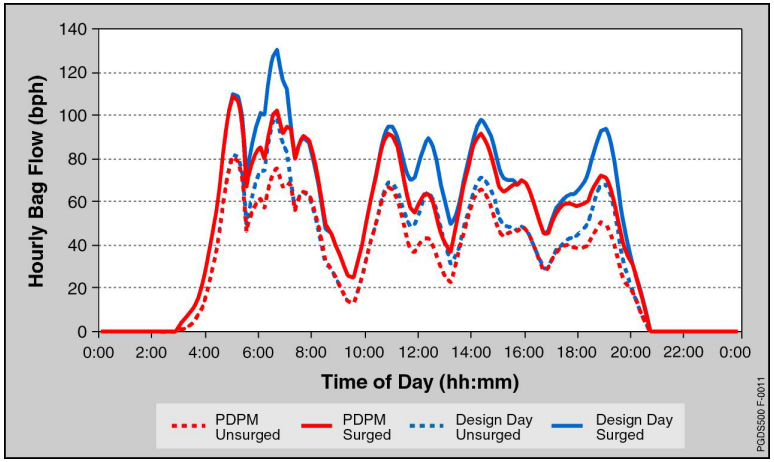


Figure C.19: Strategy-Oriented Methodology Design Load Profile, $F3_{6-7}$ Zone

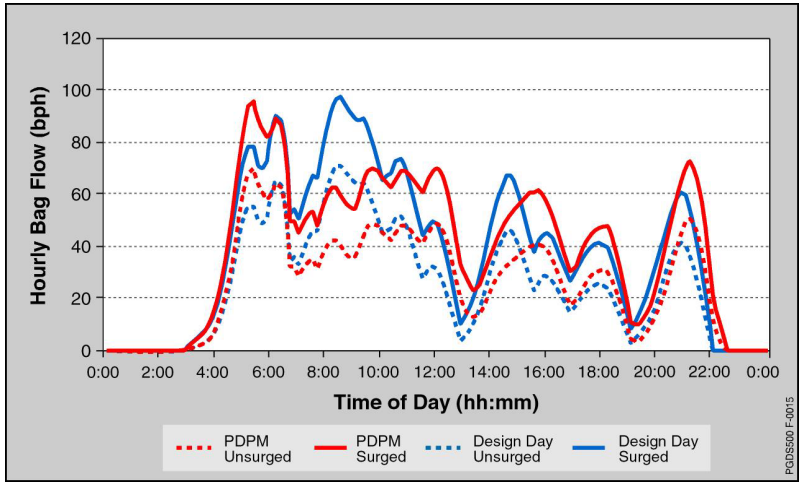


Table C.16 summarizes the PDPM, PDPM surged, and design day peak hour baggage volumes for each of the combined CBRA zones.

Using the surged peak hour design day baggage volume, EDS, OSR, and ETD equipment requirements can be calculated for each of the three combined CBRA zones.

Table C.16: Combined CBRA Zone Peak Hour Baggage Volumes

Zone	Airlines	PDPM	Peak Hour Baggage Volume PDPM Surged	Peak Hour Baggage Volume Design Day	Design Day Surged
$F3_{1-3}$	B6 - JetBlue Airways AQ - Aloha Airlines CO - Continental Airlines AA - American Airlines	412	511	419	520
$F3_{4-5}$	HP - America West Airlines YV - Mesa Airlines US - US Airways AS - Alaska Airlines QX - Horizon Air	201	271	326	415

Zone	Airlines	PDPM	Peak Hour Baggage Volume PDPM Surged	Peak Hour Baggage Volume Design Day	Design Day Surged
$F3_{6-7}$	DL - Delta Air Lines OO - SkyWest Airlines TZ - ATA Airlines UA - United Airlines A296 - United Express XX - New Entrant Airline	175	240	273	354

C.6.5.2 EDS Screening Equipment

See Table C.13 for EDS screening equipment for Alternative 3.

C.6.5.3 OSR and ETD Screening Equipment

Dedicated OSR Screening

As a mini in-line system, Alternative 3 is based on the use of dedicated OSR and ETD screening functions performed by different screeners in each of the combined CBRA zones. In general, an ETD machine would be shared between two screeners. Thus, the ratio of ETD screening stations to ETD equipment was assumed to be 2 to 1.

The formula for calculating dedicated OSR and ETD station requirements is explained below. Please note that the values used in these calculations are based on the equipment assumptions applicable at the time of the analysis. The calculation for combined screening zone $F3_{1-3}$ is shown below. Similar calculations were performed for the other two combined screening zones.

NOTE: All EDS false alarm rates and OSR clear rates are notional and are used for this example only. False alarm rates are considered SSI and, along with OSR clear rates, can be requested from TSA.

$$N_{OSR} = (N_{EDS} \times Throughput_{EDS} \times FA_{EDS}) \div (Throughput_{OSR})$$
$$= (xxx\ bph \times 15\%) \div 180\ bph)$$
$$= xxx$$
$$N_{ETD\ Stations} = (N_{EDS} \times Throughput_{EDS} \times FA_{EDS} \times (1\text{-}CR_{OSR})) \div (Throughput_{ETD\ Screener})$$
$$= (xxx\ bph \times 15\% \times 40\%) \div 24.2\ bph$$
$$= xxx$$

Table C.17 indicates the quantity of combined OSR/ETD stations and ETD machines that would be required for Alternative 3.

Table C.17: Combined CBRA OSR/ETD Calculations

Zone	Airlines	Peak Hour Bag Volume	EDS Throughput (bags/hour)	# EDS	# EDS With Redundancy	Number of combined OSR/ETD stations	Number of ETD machines
$F3_{1-3}$	B6 - JetBlue Airways AQ - Aloha Airlines CO - Continental Airlines AA - American Airlines	520	350	3	Same	1	2
$F3_{4-5}$	HP - America West Airlines YV - Mesa Airlines US - US Airways AS - Alaska Airlines QX - Horizon Air	415	350	2	Same	1	2
$F3_{6-7}$	DL - Delta Air Lines OO - SkyWest Airlines TZ - ATA Airlines UA - United Airlines A296 - United Express XX - New Entrant Airline	354	350	2	Same	1	2

C.7 Analysis and Evaluation

The alternatives were evaluated using both qualitative assessment based on expert judgment and quantitative analysis of the life-cycle costs of the alternatives.

C.7.1 Qualitative Assessment

Table C-18 shows the qualitative assessment matrix and criteria used to assess all spatially feasible alternatives for Terminal 1. Several qualitative criteria were used to assess the alternatives based on expert judgment, namely:

- Customer level of service – the effect that each alternative would have on the passenger's experience at the Airport.
- Effect on Airport operations – the reliability and maintainability of the EDS equipment and the contingency procedures that could be implemented if a machine were inoperative during a peak period, as well as the effect that the alternative would have on the airlines.
- Economic considerations – the costs associated with TSA staff salaries and with implementing and maintaining the alternative.

- Design criteria – the effect that the alternative would have on existing facilities as well as the ease with which the alternative could be constructed or expanded.

Results of the qualitative assessment are shown in Table C.18 by alternative.

Table C.18: Qualitative Assessment Matrix

Criterion	Alternative 1	Alternative 2A	Alternative 2B	Alternative 3
Screening capacity	Adequate	Adequate	Adequate	Adequate
Customer level of service	Affected	Same	Same	Same
Operations	-	-	-	-
Utilization of EDS equipment	Moderate	Moderate	Moderate	Moderate
Reliability and availability	Lower	Moderate	Moderate	Moderate
Contingency operations	Adequate	Moderate	Moderate	Moderate
Maintainability	Adequate	Adequate	Adequate	Adequate
Impact to airline operations	Moderate	Moderate	Moderate	Higher
Design	-	-	-	-
Impact on existing facilities	Higher	Lower	Lower	Moderate
Expandability	More difficult	Feasible	Feasible	Feasible
Constructability and phasing	More difficult	Moderate	Moderate	More difficult

All alternatives would provide adequate screening capacity, meet performance standards, be equally maintainable, and provide moderate EDS utilization (typical of decentralized alternatives).

- **Alternative 1**. Alternative 1 would have the greatest effect on customer level of service because lobby space would be reduced by approximately 40% to accommodate the EDS machines behind the ticket counters. The maintainability of this alternative would be the lowest because it would involve the highest number of EDS machines. Alternative 1 was determined to be the worst performing alternative from economic and design standpoints as it would have high capital, maintenance, and operating costs; require the highest number of TSA screeners; have the greatest effect on existing facilities; and would be the most difficult to construct, phase, and expand.
- **Alternative 2A**. Alternative 2A was rated the best in terms of the evaluation criteria. It was determined that Alternative 2A is the most suitable type of checked baggage screening system to be implemented in Terminal 1. Alternative 2A has cost and operational characteristics consistent with the Port's expansion plans and is sufficiently flexible to quickly adapt to changes (e.g., different EDS equipment).

- **Alternative 2B**. Alternative 2B was rated the second best in terms of the evaluation criteria. Alternative 2B would not be as well suited to the Airport as Alternative 2A because of the higher capital cost required to install the remote OSR. Also the 95th percentile bag time in system was 8.90 minutes compared with 6.34 minutes for Alternative 2A. Although fewer bags were processed in the Baggage Inspection Room for Alternative 2B than for Alternative 2A, Alternative 2B still had a higher 95th percentile bag time in system because all of the bags that were sent to the Baggage Inspection Room were subject to a directed ETD search, which requires a longer processing time than the combined OSR/ETD search performed under Alternative 2A.
- **Alternative 3**. Alternative 3 would have a great effect on airline operations because of the combined baggage makeup areas, which are not airline specific. In addition, the Baggage Inspection Room would not be easily accessible, and that may create operational and security difficulties. Alternative 3 also has high capital costs; is difficult to construct and phase; and would have a significant effect on the airline baggage makeup operations because airlines would be required to share baggage carousels. In addition, Alternative 3 would occupy more space because of the increased number of automated conveyors.

Alternatives 2A and 2B had the highest scores, while Alternative 1 had the lowest score among the alternatives based on the above high-level qualitative assessment and expert judgment.

C.7.2 Quantitative Life-Cycle Cost Analysis

A life cycle cost analysis (LCCA) of the alternatives was then conducted. Based on the LCCA of each alternative, the preliminary ranking, and discussions with TSA and Airport staff, a decision was made as to the optimal solution that would best meet the Airport's needs while remaining a viable cost-effective alternative for TSA.

The LCCA was based on the methodology applicable at the time; see Chapter 11 for the current methodology. A real discount rate of 7% per year and an analysis period of 20 years were used. The costs used in the LCCA were based on the costs provided in the PGDS version valid at the time of the analysis unless otherwise stated. A summary of the costs is provided in Table C.19.

Table C.19: Unit Costs Used in the Life Cycle Cost Analysis

Life cycle costs	Alternative 1 CT-80	Alternative 2A L-3 eXaminer SX	Alternative 2B L-3 eXaminer SX	Alternative 3 L-3 eXaminer SX
Capital Costs	-	-	-	-
Screening equipment purchase	$285,000	$350,000	$350,000	$350,000
Screening equipment installation	100,000	100,000	100,000	100,000
Screening equipment refurbishment	80,000	85,000	85,000	85,000
Screening equipment replacement	50,000	50,000	50,000	50,000
EDS cost of removal	20,000	20,000	20,000	20,000
Required infrastructure modifications to the building and BHS	350,000	650,000	700,000	2,100,000
Operating and Maintenance Costs	-	-	-	-
Screening equipment maintenance	$28,500	$35,000	$35,000	$35,000
Screening equipment power consumption	1.6 kWh	4.4 kWh	4.4 kWh	4.4 kWh
Incremental BHS maintenance costs (including additional maintenance personnel)	33,040	33,040	33,040	33,040

Notes:
1. All of the costs listed are unit costs per machine.
2. Costs not provided in the Planning Guidelines and Design Standards, but rather determined using expert judgment.
3. The costs vary by alternative because some alternatives require significantly more infrastructure modifications than others. Whenever necessary, expert judgment was used.

The methodology used to calculate the Life Cycle Costs (LCCs) is described below:

- It was assumed that installation of the in-line system would begin in 2007 and that the DBU of the in-line system would be in 2008.
- All EDS machines were assumed to be refurbished after seven years and replaced with new machines four years later.
- All maintenance costs were assumed to be covered by the manufacturer during the first year of operation of a new EDS machine.
- Using expert judgment, incremental BHS operating costs were calculated at 10% of the screening equipment operating costs.
- It was assumed that the EDS machine residual value equals the disposal cost of the EDS machine. As these two costs balance each other, they were not included in the calculations.

Based on the assumptions and costs provided above, the total net present value of the LCCs for each of the alternatives is presented in Table C.20.

Table C.20: Alternative Life Cycle Costs

Alternatives	Life cycle costs
Alternative 1	$41,348,128
Alternative 2A	25,272,491
Alternative 2B	22,771,578
Alternative 3	31,577,852

Note: Life-cycle costs are present value costs over 20 years.

The lowest LCC for Terminal 1 was for Alternative 2B ($22.77 million), with Alternative 2A having the next lowest LCC ($25.27 million).

The difference in LCC between Alternatives 2A and 2B was relatively small (the LCC for Alternative 2B is approximately 10% lower than for Alternative 2A), so these two alternatives were kept for presentation to stakeholders while Alternatives 1 and 3 were eliminated from further consideration.

As the LCCs for Alternatives 2A and 2B were similar and Alternative 2A was rated as qualitatively superior to Alternative 2B, Alternative 2A was selected as the preferred alternative for Terminal 1. Note that this decision was based on input from stakeholders, assessment of the qualitative effects of the systems, and the marginal difference in LCCs between Alternatives 2A and 2B. Therefore, while Alternative 2A would be slightly more expensive from a life-cycle cost perspective, the qualitative benefits of the system outweighed the slightly higher life-cycle cost.

The LCCAs for each of the alternatives are shown in Figure C.20 through Figure C.23.

Figure C.20: Terminal 1, Alternative 1, Life Cycle Cost Analysis

Cost Categories	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Capital Costs										
Screening equipment purchase	--	$4,845,000	--	--	--	--	--	--	--	--
Screening equipment installation	--	1,700,000	--	--	--	--	--	--	--	--
Screening equipment refurbishment	--	--	--	--	--	--	--	--	$1,360,000	--
Screening equipment replacement	--	--	--	--	--	--	--	--	850,000	--
EDS removal	--	--	--	--	--	--	--	--	--	--
Required infrastructure modifications to the building and BHS	$5,950,000	--	--	--	--	--	--	--	--	--
O&M Costs										
Screening equipment maintenance	--	--	$484,500	$484,500	$484,500	$484,500	$484,500	$484,500	484,500	$484,500
Screening equipment operating	--	23,827	23,827	23,827	23,827	23,827	23,827	23,827	23,827	23,827
Incremental BHS maintenance (including additional maintenance personnel)	--	561,680	561,680	561,680	561,680	561,680	561,680	561,680	561,680	561,680
Incremental BHS operating	--	2,383	2,383	2,383	2,383	2,383	2,383	2,383	2,383	2,383
Staffing Costs										
TSA screener and supervisor	--	1,310,074	1,310,074	1,310,074	1,358,147	1,358,147	1,358,147	1,358,147	1,358,147	1,358,147
Staff associated with clearing bag jams or portering bags (if not included in O&M costs described above)	--	--	--	--	--	--	--	--	--	--
Total	**$5,950,000**	**$8,442,964**	**$2,382,464**	**$2,382,464**	**$2,430,537**	**$2,430,537**	**$2,430,537**	**$2,430,537**	**$4,640,537**	**$2,430,537**
Discount Factor	1.000	1.070	1.145	1.225	1.311	1.403	1.501	1.606	1.718	1.838
Discounted Annual Costs	$ 5,950,000	$7,890,620	$2,080,936	$1,944,800	$1,854,245	$1,732,939	$1,619,569	$1,513,616	$2,700,835	$1,322,051
Present Value of Costs	$41,348,128	--	--	--	--	--	--	--	--	--

Figure C.20 (page 2 of 2): Terminal 1, Alternative 1, Life Cycle Cost Analysis

Cost Categories	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Capital Cost										
Screening equipment purchase	--	--	$4,845,000	--	--	--	--	--	--	--
Screening equipment installation	--	--	1,700,000	--	--	--	--	--	--	--
Screening equipment refurbishment	--	--	--	--	--	--	--	--	--	$1,360,000
Screening equipment replacement	--	--	--	--	--	--	--	--	--	850,000
EDS removal	--	--	340,000	--	--	--	--	--	--	--
Required infrastructure modifications to the building and BHS	--	--	--	--	--	--	--	--	--	--
O&M Costs										
Screening equipment maintenance	$484,500	$484,500	-	$484,500	$484,500	$484,500	$484,500	$484,500	$484,500	484,500
Screening equipment operating	23,827	23,827	23,827	23,827	23,827	23,827	23,827	23,827	23,827	23,827
Incremental BHS maintenance (including additional maintenance personnel)	561,680	561,680	561,680	561,680	561,680	561,680	561,680	561,680	561,680	561,680
Incremental BHS operating	2,383	2,383	2,383	2,383	2,383	2,383	2,383	2,383	2,383	2,383
Staffing Costs										
TSA screener and supervisor	1,358,147	1,358,147	1,358,147	1,358,147	1,358,147	1,358,147	1,358,147	1,358,147	1,358,147	1,358,147
Staff associated with clearing bag jams or portering bags (if not included in O&M costs described above)	--	--	--	--	--	--	--	--	--	--
Total	**$2,430,537**	**$2,430,537**	**$8,831,037**	**$2,430,537**	**$2,430,537**	**$2,430,537**	**$2,430,537**	**$2,430,537**	**$2,430,537**	**$4,640,537**
Discount Factor	1.967	2.105	2.252	2.410	2.579	2.759	2.952	3.159	3.380	3.617
Discounted Annual Costs	$1,235,562	$1,154,731	$3,921,086	$1,008,586	$942,604	$880,938	$823,307	$769,446	$719,108	$1,283,147
Present Value of Costs	--	--	--	--	--	--	--	--	--	--

Notes:

- Costs for TSA staffing are notional and may not reflect existing staffing estimates, unit costs, or policies.
- This example is based on a study that has been commissioned by the Port of Oakland, however, some costs estimates are derived from the BSIS Guidelines rather than the actual cost estimates developed by the Oakland study. These cost estimates do not necessarily reflect final results and conclusions for the study commissioned by the Port.

Figure C.21: Terminal 1, Alternative 2a, Life Cycle Cost Analysis

Cost Categories	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Capital Cost										
Screening equipment purchase	--	$2,450,000	--	--	--	--	--	--	--	--
Screening equipment installation	--	700,000	--	--	--	--	--	--	--	--
Screening equipment refurbishment	--	--	--	--	--	--	--	--	$595,000	--
Screening equipment replacement	--	--	--	--	--	--	--	--	350,000	--
EDS removal	--	--	--	--	--	--	--	--	--	--
Required infrastructure modifications to the building and BHS	$ 4,550,000	--	--	--	--	--	--	--	--	--
O&M Costs										
Screening equipment maintenance	--	--	$245,000	$245,000	$245,000	$245,000	$245,000	$245,000	245,000	$245,000
Screening equipment operating	--	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981
Incremental BHS maintenance (including additional maintenance personnel)	--	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280
Incremental BHS operating	--	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698
Staffing Costs										
TSA screener and supervisor		847,329	973,563	973,563	1,021,636	1,021,636	1,069,709	1,069,709	1,069,709	1,069,709
Staff associated with clearing bag jams or portering bags (if not included in O&M costs described above)	--	--	--	--	--	--	--	--	--	--
Total	$ 4,550,000	$4,258,288	$1,479,522	$1,479,522	$1,527,595	$1,527,595	$1,575,668	$1,575,668	$2,520,668	$1,575,668
Discount Factor	1.000	1.070	1.145	1.225	1.311	1.403	1.501	1.606	1.718	1.838
Discounted Annual Costs	$ 4,550,000	$3,979,708	$1,292,272	$1,207,731	$1,165,395	$1,089,154	$1,049,934	$981,247	$1,467,052	$857,059
Present Value of Costs	$25,272,491	--	--	--	--	--	--	--	--	--

Figure C.21 (page 2 of 2): Terminal 1, Alternative 2a, Life Cycle Cost Analysis

Cost Categories	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Capital Cost										
Screening equipment purchase	--	--	$2,450,000	--	--	--	--	--	--	--
Screening equipment installation	--	--	700,000	--	--	--	--	--	--	--
Screening equipment refurbishment	--	--	--	--	--	--	--	--	--	$595,000
Screening equipment replacement	--	--	--	--	--	--	--	--	--	350,000
EDS removal	--	--	140,000	--	--	--	--	--	--	--
Required infrastructure modifications to the building and BHS	--	--	--	--	--	--	--	--	--	--
O&M Costs										
Screening equipment maintenance	$245,000	$245,000	--	$245,000	$245,000	$245,000	$245,000	$245,000	$245,000	245,000
Screening equipment operating	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981
Incremental BHS maintenance (including additional maintenance personnel)	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280
Incremental BHS operating	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698
Staffing Costs										
TSA screener and supervisor	1,069,709	1,069,709	1,069,709	1,069,709	1,069,709	1,069,709	1,069,709	1,069,709	1,069,709	1,069,709
Staff associated with clearing bag jams or portering bags (if not included in O&M costs described above)	--	--	--	--	--	--	--	--	--	--
Total	**$1,575,668**	**$1,575,668**	**$4,620,668**	**$1,575,668**	**$1,575,668**	**$1,575,668**	**$1,575,668**	**$1,575,668**	**$1,575,668**	**$2,520,668**
Discount Factor	1.967	2.105	2.252	2.410	2.579	2.759	2.952	3.159	3.380	3.617
Discounted Annual Costs	$800,990	$748,588	$2,051,632	$653,846	$611,071	$571,095	$533,733	$498,816	$466,183	$696,986
Present Value of Costs	--	--	--	--	--	--	--	--	--	--

Notes:

- Costs for TSA staffing are notional and may not reflect existing staffing estimates, unit costs, or policies.
- This example is based on a study that has been commissioned by the Port of Oakland, however, some costs estimates are derived from the BSIS Guidelines rather than the actual cost estimates developed by the Oakland study. These cost estimates do not necessarily reflect final results and conclusions for the study commissioned by the Port.

Figure C.22: Terminal 1, Alternative 2b, Life Cycle Cost Analysis

Cost Categories	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Capital Cost										
Screening equipment purchase	--	$2,450,000	--	--	--	--	--	--	--	--
Screening equipment installation	--	700,000	--	--	--	--	--	--	--	--
Screening equipment refurbishment	--	--	--	--	--	--	--	--	$595,000	--
Screening equipment replacement	--	--	--	--	--	--	--	--	350,000	--
EDS removal	--	--	--	--	--	--	--	--	--	--
Required infrastructure modifications to the building and BHS	$4,900,000	--	--	--	--	--	--	--	--	--
O&M Costs										
Screening equipment maintenance	--	--	$245,000	$245,000	$245,000	$245,000	$245,000	$245,000	245,000	$245,000
Screening equipment operating	--	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981
Incremental BHS maintenance (including additional maintenance personnel)	--	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280
Incremental BHS operating	--	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698
Staffing Costs										
TSA screener and supervisor	--	751,183	751,183	751,183	751,183	751,183	751,183	751,183	751,183	751,183
Staff associated with clearing bag jams or portering bags (if not included in O&M costs described above)	--	--	--	--	--	--	--	--	--	--
Total	**$ 4,900,000**	**$4,162,142**	**$1,257,142**	**$1,257,142**	**$1,257,142**	**$1,257,142**	**$1,257,142**	**$1,257,142**	**$2,202,142**	**$1,257,142**
Discount Factor	1.000	1.070	1.145	1.225	1.311	1.403	1.501	1.606	1.718	1.838
Discounted Annual Costs	$4,900,000	$3,889,852	$1,098,036	$1,026,202	$959,068	$896,325	$837,687	$782,885	$1,281,667	$683,802
Present Value of Costs	$22,771,578									

Figure C.22 (page 2 of 2): Terminal 1, Alternative 2b, Life Cycle Cost Analysis

Cost Categories	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Capital Cost										
Screening equipment purchase	--	--	$2,450,000	--	--	--	--	--	--	--
Screening equipment installation	--	--	700,000	--	--	--	--	--	--	--
Screening equipment refurbishment	--	--	--	--	--	--	--	--	--	$595,000
Screening equipment replacement	--	--	--	--	--	--	--	--	--	350,000
EDS removal	--	--	140,000	--	--	--	--	--	--	--
Required infrastructure modifications to the building and BHS	--	--	--	--	--	--	--	--	--	--
O&M Costs										
Screening equipment maintenance	$245,000	$245,000	--	$245,000	$245,000	$245,000	$245,000	$245,000	$245,000	245,000
Screening equipment operating	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981
Incremental BHS maintenance (including additional maintenance personnel)	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280
Incremental BHS operating	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698
Staffing Costs										
TSA screener and supervisor(a)	751,183	751,183	751,183	751,183	751,183	751,183	751,183	751,183	751,183	751,183
Staff associated with clearing bag jams or portering bags (if not included in O&M costs described above)	--	--	--	--	--	--	--	--	--	--
Total	**$1,257,142**	**$1,257,142**	**$4,302,142**	**$1,257,142**	**$1,257,142**	**$1,257,142**	**$1,257,142**	**$1,257,142**	**$1,257,142**	**$2,202,142**
Discount Factor	1.967	2.105	2.252	2.410	2.579	2.759	2.952	3.159	3.380	3.617
Discounted Annual Costs	$639,067	$597,259	$1,910,202	$521,669	$487,541	$455,646	$425,837	$397,979	$371,943	$608,911
Present Value of Costs	--	--	--	--	--	--	--	--	--	--

Notes:

- Costs for TSA staffing are notional and may not reflect existing staffing estimates, unit costs, or policies.
- This example is based on a study that has been commissioned by the Port of Oakland, however, some costs estimates are derived from the BSIS Guidelines rather than the actual cost estimates developed by the Oakland study. These cost estimates do not necessarily reflect final results and conclusions for the study commissioned by the Port.

Figure C.23: Terminal 1, Alternative 3, Life Cycle Cost Analysis

Cost Categories	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Capital Cost										
Screening equipment purchase	--	$2,450,000	--	--	--	--	--	--	--	--
Screening equipment installation	--	700,000	--	--	--	--	--	--	--	--
Screening equipment refurbishment	--	--	--	--	--	--	--	--	$595,000	--
Screening equipment replacement	--	--	--	--	--	--	--	--	350,000	--
EDS removal	--	--	--	--	--	--	--	--	--	--
Required infrastructure modifications to the building and BHS	$14,700,000	--	--	--	--	--	--	--	--	--
O&M Costs										
Screening equipment maintenance	--	--	$245,000	$245,000	$245,000	$245,000	$245,000	$245,000	245,000	$245,000
Screening equipment operating	--	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981
Incremental BHS maintenance (including additional maintenance personnel)	--	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280
Incremental BHS operating	--	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698
Staffing Costs										
TSA screener and supervisor (a)	--	655,037	655,037	655,037	655,037	655,037	655,037	655,037	655,037	655,037
Staff associated with clearing bag jams or portering bags (if not included in O&M costs described above)	--	--	--	--	--	--	--	--	--	--
Total	**$14,700,000**	**$4,065,996**	**$1,160,996**	**$1,160,996**	**$1,160,996**	**$1,160,996**	**$1,160,996**	**$1,160,996**	**$2,105,996**	**$1,160,996**
Discount Factor	1.000	1.070	1.145	1.225	1.311	1.403	1.501	1.606	1.718	1.838
Discounted Annual Costs	$14,700,000	$3,799,996	$1,014,059	$947,718	$885,718	$827,774	$773,621	$723,010	$1,225,709	$631,505
Present Value of Costs	$31,577,852	--	--	--	--	--	--	--	--	--

Figure C.23 (page 2 of 2): Terminal 1, Alternative 3, Life Cycle Cost Analysis

Cost Categories	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Capital Cost										
Screening equipment purchase	--	--	$2,450,000	--	--	--	--	--	--	--
Screening equipment installation	--	--	700,000	--	--	--	--	--	--	--
Screening equipment refurbishment	--	--	--	--	--	--	--	--	--	$595,000
Screening equipment replacement	--	--	--	--	--	--	--	--	--	350,000
EDS removal	--	--	140,000	--	--	--	--	--	--	--
Required infrastructure modifications to the building and BHS	--	--	--	--	--	--	--	--	--	--
O&M Costs										
Screening equipment maintenance	$245,000	$245,000	--	$245,000	$245,000	$245,000	$245,000	$245,000	$245,000	245,000
Screening equipment operating	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981	26,981
Incremental BHS maintenance (including additional maintenance personnel)	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280	231,280
Incremental BHS operating	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698	2,698
Staffing Costs										
TSA screener and supervisor (a)	655,037	655,037	655,037	655,037	655,037	655,037	655,037	655,037	655,037	655,037
Staff associated with clearing bag jams or portering bags (if not included in O&M costs described above)	--	--	--	--	--	--	--	--	--	--
Total	**$1,160,996**	**$1,160,996**	**$4,205,996**	**$1,160,996**	**$1,160,996**	**$1,160,996**	**$1,160,996**	**$1,160,996**	**$1,160,996**	**$2,105,996**
Discount Factor	1.967	2.105	2.252	2.410	2.579	2.759	2.952	3.159	3.380	3.617
Discounted Annual Costs	$590,191	$551,581	$1,867,512	$481,772	$450,254	$420,798	$393,269	$367,542	$343,497	$582,325
Present Value of Costs	--	--	--	--	--	--	--	--	--	--

Notes:

- Costs for TSA staffing are notional and may not reflect existing staffing estimates, unit costs, or policies.
- This example is based on a study that has been commissioned by the Port of Oakland, however, some costs estimates are derived from the BSIS Guidelines rather than the actual cost estimates developed by the Oakland study. These cost estimates do not necessarily reflect final results and conclusions for the study commissioned by the Port.

C.8 Final Considerations

The development of conceptual alternatives and selection of the preferred solutions for any airport terminal is an iterative process based both on quantifiable analysis and good judgment. Terminal space constraints, airline preferences, and TSA security and operational considerations play major roles in determining which zoning schemes can be successfully translated into a feasible concept. Cost considerations are fundamental in determining which concepts should be eliminated in the process of selecting the preferred alternatives.

In this particular case study, the preferred alternative had the second lowest cost as identified by the life cycle cost analysis, the best design, and the fewest operational effects on the Airport.

APPENDIX D:

COMMISSIONING AND EVALUATION TESTING

D.1 Commissioning and Evaluation Overview

The system will be evaluated using various test procedures to evaluate system performance and suitability. Additionally, the test facilitators and TSA will determine compliance with the requirements established in the PGDS. Each CBIS tested will be tested using a test plan approved by TSA. This test plan will not be shared with the ILDT or Airport Teams. As each CBIS is unique, the ISAT tests may be a subset of this overall suite and may contain additional or modified tests as needed to evaluate the individual CBIS for adherence to the requirements.

The test and evaluation information described herein apply to all CBIS (In-line and Mini In-line), and associated BHSs, including the delivery to and takeaway from the screening system unless specifically stated otherwise.

The physical, programming, networking, and reports of the entire CBIS will be in final operational configuration prior to ISAT. This includes (unless waivered):

- All induction points tied in (unless phased)
- All BHS conveyors, pathways, and components are operational (CBRA lines, OOG/OS lines, RI lines, clear outbound paths, BMAs, ATRs, etc.), including legacy BHS components delivering bags to the CBIS and taking bags away from the CBIS
- All BHS interfaces operational (including manual encode stations; IQ; E-stops; BRPs, BISs, and BSDs; jam control stations; etc.)
- All BHS functionality (e.g., bag allocation, load leveling, merge logic, purge logic, and other conditional performance programming)
- All EDS components (EDS, CI, PVS, SVS) installed and networked in final—not temporary—configuration, to include redundancy, if applicable
- BHS network in final configuration accessible via the BHS control room and its interfaces, including redundancy, if applicable
- Complete BHS/CBIS reports

TSA uses various sizes of bags and weights to represent stream of commerce during ISAT. Average bag lengths may differ depending on the bag set and local policy. Bag weights vary from 5 to 50 pounds. The ILDT should use bags of varying sizes and weights during pre-ISAT testing. Table D.1 shows bag dimensions (LxWxH) of a nominal TSA bag set; however, this is only one example of a diverse bag set.

Table D.1: TSA ISAT Bag Dimensions

Bag Type	Length (inches)	Width (inches)	Height (inches)
1	27	19	10
2	24	15	9
3	22	12	12
4	26	17	10
5	22	15	9
6	21	14	7.5
7	27	19	10
8	24	15	9
9	22	12	12
10	28	23	8.5
11	27	19	10.5
12	23	21	8
13	35	16	15
14	30	15	10
15	17	9	7
16	30	18	18
17	43	16	6
18	52	16	6

In addition to the specific tests described in this appendix, the reporting capabilities defined in Section 12.13 will be reviewed to verify that all required reports have been provided and that the reports are accurate.

CBIS Testing is divided into four suites. These suites are:

1. Introductory Testing
2. Detailed Testing
3. System-wide Testing
4. Operational Run-In

When any change to the CBIS is required following issuance of the TRN through the completion of ISAT, a change request will be submitted as defined in Section 4.2.2 and Section A.5.

The specific tests described in Section D.2.1 below contain requirements to verify that the reporting capabilities defined in Section 12.13 have been provided and that the reports are accurate, as well as that the BHS displays in the CBRA meet the requirements defined in Section 14.33.

Testing will confirm other PGDS requirements that include evaluation of CBIS performance relative to the requirements set forth in the following PGDS Sections and submitted procedures and processes:

Section	Requirements Verified
8.3.4	Procedures Requirements • Bag Induction Procedures • CBIS Fail-safe Procedures • Bag Jam and Fault Clearing Procedures
10.3.4	PLC Code • Test and Commissioning (Process, Support, Final Configuration)
12.3.2	Tail-to-Head Bag Spacing • The speed of the queue belt immediately before and after the EDS unit as bags transition into and out of the EDS shall comply with the EDS Integration Manual
12.8.3	Divert and Merge Requirements • Item 2: Separated clear and non-clear bags shall not be commingled
12.8.6	Recirculation Loop Requirement • The automatic recirculation of bags shall not be designed, either pre-EDS screening or post-EDS screening, except for automated reinsertion lines in the CBRA as shown in Chapter 12.
12.8.7	Reinsertion Line Requirement • Non-cleared bags shall only be reinserted upstream of the STZ
12.8.8	Draft Curtains Requirement • All PECs shall be clear of obstructions including draft curtains
16.8.3	Specific STIP Design Requirement • All ETDs and stand-alone EDSs shall have 1 “dual telecommunications outlet”

Section	Requirements Verified
12.13.5	BHS Reporting During Maintenance • BHS Reporting capabilities shall be designed such that logging of system events and bag counts are able to be disabled for maintenance activities.
14.2	CBRA Layout and Equipment • CBRA layout and Equipment Details • Ergonomic Dimensions of CBRA Interfaces and Component
Chapter 13	OSR Planning • OSR Components
13.4.3	OSR Room Layout
7.5.3.1	Programming Logic (Contingency Planning)
A.4	Daily CBIS Report Examples
A.5	CBIS Change Request
A.7	Request for PGDS Variance Template

D.2 Introductory Testing

Introductory tests will be performed on each spur line containing an EDS. Bags should be inducted from the point of acquisition of tracking through the EDS to the points of diversion to the Clear/outbound lines and into the CBRA. During testing bags should be inducted from their natural points of origin (e.g., ticket counters, curbside) at least once prior to ISAT.

For all EDS, bag spacing—both tail-to-head and head-to-head—should be optimized to meet the required throughput rate and still maintain positive bag tracking. The ILDT will ensure that all tracking and spacing is compliant with the OEM's Site Planning and Installation guidelines.

D.2.1 CBRA Equipment and Functionality Test

Purpose: The CBRA Equipment and Functionality Test will be performed to assess compliance with PGDS or TSA-approved CBRA requirements relating to CBRA equipment, layout, and functionality and controls.

Procedure: This test will be performed in two parts run contiguously as a single test to observe and evaluate the CBIS in distinct functionality regimes.

Part 1, Alarm Line Queuing with Automated Re-Insertion:

- CBRA Configuration:
  - Enable two or three BIS, starting from the most downstream. Ensure that there are one or two intermediate queues between the enabled BIS.
  - Induct enough alarm bags to exercise all three queuing levels and invoke use of the intermediate queues. The induction rate and quantities should be controlled so that queuing levels can be distinctly assessed. During this part of the test, Alarm Line Queuing Levels, automatic reinsert functionality, and the display details and display options for most bag types will be verified. In addition, SVS information will be confirmed for both the Alarmed bag arrival (via automatic lookup) and Unknown bag arrival (via scan gun operation).
  - Create differing bag statuses. Of the bags arriving at enabled BRPs, they should possess differing statuses consisting of those described in PGDS (i.e., Alarmed, Unknown – lost alarm bag, OOG, Timeout, and EDS Error – as applicable).
    - For Unknown status, manipulate a bag post-EDS
    - For EDS Errored, enable an EDS E-stop when 1 or 2 alarm bags are in the scan plane of the EDS. Other methods to generate the EDS Errored status may be used.
    - Use an OOG bag only if OOG bags are routed to CBRA and it's a valid status
    - For a Timeout bag, advise PVS Operator to let one Alarmed bag to timeout on-screen in OSR.
- Once the target bags occupy the enabled BRP/BIS, document and verify that the Unknown, EDS Errored, and OOG bag present the option for automatic "Reinsert" on the BIS BSD.
- While processing bags from BRPs, confirm that bags are assigned to the BRP from which a bag was most recently cleared, or first logged in BRP, whichever is available first.
- Ensure that the remaining Timeout and Alarmed bags on the BIS are not cleared, i.e., the BIS remains occupied.

Part 2, Alarm Line Queuing with Manual Re-Insertion, BIS E-Stops, and Other Display Assessment:

- CBRA functionality and manual reinsert logic and functionality will be verified.
- Induct additional Alarmed bags, based on how many intermediate queues are in-between the BIS that were enabled in Part 1. For CBIS possessing large CBRAs, enough bags will be inducted in this part of the test to permit manual reinsertion from all BIS positions.
- Create several Unknown status bags to be processed from BRPs under Manual Reinsertion conditions..
- Near the end of the resolution of inducted bags, one of the BIS E-Stops should be selected to confirm expected functionality and all bags statuses should be maintained.

- The display status and options for the remaining bag arrival types not already confirmed will be created while queued bags are processed following CBRA clearing procedures.
- Clear Bag Routing to CBRA: Configure the CBIS final decision point to divert all bags to CBRA and induct an Alarmed Bag that will be cleared by OSR with 5-10 seconds of viewing time remaining. Confirm BSD status and other display details.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
12.7.1.2	Post-EDS Requirements
12.13	CBIS Reporting
14.2	CBRA Layout and Equipment
14.5	CBRA Functionality
14.6	Workstation Sequence of Operations

D.2.2 Travel Time/On-Screen Resolution Test

Purpose: The Travel Time/OSR Test will be performed to ensure that enough conveyor travel distances are available for the use of OSR protocols. This test will also evaluate bag routing and BHS/EDS network interfaces in accordance with OSR-related settings on the EDS during late and absent Level 2 OSR screening decisions or when a high percentage of alarm bags are identified during Level 1 screening.

Procedure 1 and Procedure 2 are conducted for each EDS line. Procedures 3, 4, and 5 will be performed a minimum of once per CBIS.

Procedure: The CBIS displays and reporting databases will be evaluated to confirm appropriate bag routing and status information based on OSR decisions.

- **Procedure 1, Operator Timeout**: A Suspect bag is screened through the EDS and an OSR Decision is withheld indefinitely, forcing an EDS decision based on the decision time setting. Measure the length of time between when the bag's leading edge passes through the exit from the EDS and the final diversion trigger point to the CBRA without holding bags. Measure the duration from image population at the PVS to when the image times out and either drops from the PVS display or provides a visual indication to the Operator that the OSR time has expired. If bags are held while in transit to an active decision point (HSD or Vertical Sortation Unit (VSU)), the hold time is recorded.
- **Procedure 2, Delayed Operator Decision**: A Suspect bag is screened through the EDS and an OSR Clear Decision is withheld until the image has been displayed at the OSR PVS for the maximum time prior to the decision time expiring. Confirm that the Operator screening

decision was correctly transmitted, received, and displayed at the EDS and BHS interfaces and accurately recorded within the EDS/BHS reporting systems.

- Procedure 3, Operator Timeout/Image Queue Timeout (CTX 9800 Only):
  - Part A: With a single PVS active, an Operator logged-in, and the EDS Decision Mode set to Automatic, two sequential Suspect bags are screened through an EDS. The OSR Decisions are withheld indefinitely, forcing an EDS timeout decision on the bag displayed on the PVS and the bag in the MUX image queue, based on the CTX BMTT setting. The EDS Motion Control (MC) log or Communications Report disposition codes will be compared with BHS-received dispositions and the CBRA displays to verify compliance with EDS Integration Guides and PGDS CBRA display requirements. (The Procedure 3 Test, Part A, is conducted to gather system configuration data only and will not be rated as Pass/Fail.)
  - Part B: Configure the EDS Decision Mode setting to Operator. With a single PVS active and an Operator logged-in, two sequential Suspect bags are screened through an EDS. The OSR Decisions are withheld indefinitely, forcing an EDS timeout decision on the bag displayed on the PVS and the bag in the MUX image queue, based on the CTX BMTT setting. The EDS Motion Control (MC) log or Communications Report disposition codes will be compared with BHS-received dispositions and the CBRA displays to verify compliance with EDS Integration Guides and PGDS CBRA display requirements. Reconfigure the EDS Decision mode setting to Automatic.
- **Procedure 4, Multiple Alarmed Objects (L3 OptiNet CBIS Only)**: One non-Clear bag will be screened with two or more distinct alarm objects. When the image is displayed for Level 2 (PVS) processing, one of the alarmed objects will remain unresolved (not cleared). After all other alarm objects are cleared, the bag should be Suspected at the PVS. This procedure will be repeated a second time, except with the image allowed to time-out onscreen instead of a Level 2 Operator decision. The number of alarmed objects identified in each SVS image will be recorded and compared with PVS decisions. This procedure will confirm whether PVS settings are consistent with anticipated TSA operations regarding how threat-level versus bag-level OSR decisions are reported and executed. Each image, alarmed and timed-out, will be recalled at every available SVS in the CBRA to confirm that only Alarmed objects not cleared at the PVS remain as threats requiring Level 3 inspection. Alarm objects that were cleared at the PVS should not be highlighted as Alarms in the SVS image. (The Procedure 4 Test is conducted to gather system configuration information only and will not be rated as Pass/Fail.) Note: If an EDS OEM technician can demonstrate that the configuration setting associated with each SVS is set appropriately relative to cleared objects displayed in alarm images on the SVS, this test need not be performed.
- **Procedure 5, No Final EDS Disposition**: This procedure will confirm that bag routing and status display in the CBRA is only based on the EDS Final Disposition message and the bag is not routed or displayed based on the EDS Exit Disposition Message.
- **CTX-MUX V2 Series Only**: Configure the selected EDS Timeout Value Settings to “No Timeout” (Decision Mode - Operator/Show Mode - Show All) and process one Clear bag through the EDS and CBIS decision points while withholding any Level 2 Operator Decision. Confirm the bag is routed to the CBRA and the appropriate decision message (EDS Final Disposition message [CTX_Decision_Bag_Disposition], not EDS Exit Disposition Message [CTX_Exit_Decision_Status]) is reflected in the EDS log file or EDS to BHS Communications Report.

- **L3 OptiNet Only**: Increase the selected EDS Time-to-Live (TTL) setting to allow the bag to arrive at the BRP prior to TTL expiring (All Bags Mode). The L3 Bag ID Timeout setting may also need to be increased to remain 30 seconds longer than the TTL. Process one Clear bag through the EDS and CBIS decision points while withholding any Level 2 Operator Decision. Confirm the bag is routed to the CBRA and the appropriate decision message ([EDS_ID.BagIDArray], not [EDS_ID.BagIDArray [13]] correlating with a Pending disposition (code 4)) is reflected in the EDS log file or EDS to BHS Communications Report.
- Reveal Multiplexing Only: (pending)
- Confirm the appropriate CBRA display status of EDS Error when there is no Final EDS Disposition received for a Machine Clear/Operator Pending bag. This test will be rated as "Pass" if the described confirmation checks are verified. This test will be rated as "Fail" if the results indicate bag routing or CBRA display status based on the EDS Exit Disposition.

Requirements Verified: The performance of the system is judged against the Requirements set forth in the following PGDS Sections:

Section	Requirements Verified
12.6	OSR Decision Time Requirements
12.7.1	CBIS Positive Bag Tracking
12.7.1.2	Post-EDS Requirements Item 1: BHS maintenance of EDS status Item 2: Assignment of Communication Error Item 5: Monitor and log invalid arrivals at CBRA via the BHS reporting system
14.6	Workstation Sequence of Operations

D.2.3 Over-Height Bag Test

Purpose: This test will be conducted to ensure that the CBIS recognizes Over-Height (OH) baggage and prevents it from entering any EDS. It is also used to confirm proper routing of near-maximum and -minimum conveyable height dimension baggage.

This test is to be conducted at each location in the CBIS where OH bag detection is provided.

Procedure:

- Record the measurements at which bags will activate the OH detectors.
- Observe and record that this setting is equal to the maximum bag height specification for the EDS in question.

- Introduce a stream of bags upstream of both the point of acquisition of tracking and upstream of the device used to measure bag dimensions. Bags used for testing will include those slightly greater and slightly smaller than maximum height capability of the EDS. The bag stream will also include bags near the minimum and maximum conveyable height dimensions.
- Record whether the system properly detects OH bags and prevents them from entering the EDS. In addition, record whether any non-OH bags are incorrectly detected as OH. At the conclusion of this test, the screening status and bag IDs for all bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
12.8.12	Out-Of-Gauge Bag Requirement
12.13.1	Reporting Frequency Requirement
12.13.2	Reporting Detail Requirements (all except Item 4)
12.13.3	Daily Reporting Requirements
14.6	Workstation Sequence of Operations

D.2.4 Over-Width Bag Test

Purpose: This test will be conducted to ensure that the CBIS recognizes Over-Width (OW) baggage and prevents it from entering any EDS. It is also used to confirm proper routing of near maximum and minimum conveyable width dimension baggage.

This test is to be conducted at each location in the CBIS where OW bag detection is provided.

Procedure:

- Record the measurements at which bags will activate the OW detectors.
- Ensure that this setting is equal to the maximum bag width specification for the EDS in question.
- Introduce a stream of bags upstream of both the point of acquisition of tracking and upstream of the device used to measure bag dimensions. Bags used for testing will include those slightly greater and slightly smaller than the maximum width capability of the EDS. The bag stream will also include bags near the minimum and maximum conveyable width dimensions.

- Record whether the system properly detects OW bags and prevents them from entering the EDS. In addition, record whether any in-gauge bags are incorrectly detected as OW. At the conclusion of this test, the screening status and bag ID for all bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
12.8.12	Out-Of-Gauge Bag Requirement
12.13.1	Reporting Frequency Requirement
12.13.2	Reporting Detail Requirements (all except Item 4)
12.13.3	Daily Reporting Requirements
14.6	Workstation Sequence of Operations

D.2.5 Over-Length Bag Test

Purpose: This test will be conducted to ensure that the CBIS recognizes Over-Length (OL) baggage and prevents it from entering any EDS. It is also used to confirm proper routing of near maximum and minimum conveyable length dimension baggage.

This test is to be conducted at each location in the CBIS where OL bag detection is provided.

Procedure:

- Record the measurements at which bags will activate the OL detectors.
- Ensure that this setting is equal to or less than the maximum bag length specification for the EDS in question.
- Introduce a stream of bags upstream of both the point of acquisition of tracking and upstream of the device used to measure bag dimensions. Bags used for testing will include those slightly greater and slightly smaller than the system's programmed OL setting. The bag stream will also include bags near the minimum and maximum conveyable length dimensions.
- Record whether the system properly detects OL bags and prevents them from entering the EDS. In addition, record whether any in-gauge bags are incorrectly detected as OL. At the conclusion of this test, the screening status and bag ID for all bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
12.8.12	Out-Of-Gauge Bag Requirement
12.13.1	Reporting Frequency Requirement
12.13.2	Reporting Detail Requirements (all except Item 4)
12.13.3	Daily Reporting Requirements
14.6	Workstation Sequence of Operations

D.2.6 Out-of-Gauge/Lost Bag Routing Test

Purpose: This test is conducted to evaluate the proper routing of both in-gauge and OOG bags when their dimension status tracking data is lost after passing through the bag measuring device.

The routing of lost dimension bags is required to be to a Screening Spur Line and not to the OOG Line. Further, Spur Lines are to be equipped with an Over-Height protective device at least two queues in front of each EDS to stop OH bags from entering the EDS.

Procedure:

- Introduce a bag that exceeds OOG OH or OW dimensions upstream of the baggage dimensioning equipment.
- After the bag has been processed through the dimensioning equipment and prior to the OOG or first screening line diversion, whichever is first, the OOG bag will be delayed, causing a loss of dimension status tracking data.
- The procedure will be repeated using a bag that does not exceed OOG dimensions.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
12.8.12	Out-Of-Gauge Bag Requirement
12.13.1	Reporting Frequency Requirement
12.13.2	Reporting Detail Requirements (all except Item 4)
12.13.3	Daily Reporting Requirements
14.6	Workstation Sequence of Operations

D.2.7 Duplicated IATA/RFID Tag Test

Purpose: This test will be performed on CBISs that utilize IATA/Radio Frequency Identification (RFID) tag data in the security screening process. The test will evaluate the CBIS response, including the BHS reporting system, when a duplicated IATA/RFID tag is presented or the same IATA/RFID tag ID is screened more than once with differing screening decisions. These procedures will be performed once for each upstream ATR/RFID reader and include an assessment of CBRA hand scanner functionality for bag status/ID acquisition under duplicated tag scenarios.

Duplicated IATA/RFID Procedure 1 (Leading Alarmed Bag):

- Five bags sharing the same duplicated tag data will be introduced to the CBIS with 5- to 10-second spacing and processed through the same EDS. A reprinted RFID/IATA tag, cut tag, or use of IATA bingo tags are options for creating the tag ID duplication. The IATA barcode sticker should be affixed to each bag in a location that will provide a high probability for a good read.
- The induction sequence will be Alarmed, Cleared, Alarmed, Alarmed, and Cleared.
- Each non-Clear tracked bag will be handled normally in the CBRA, using BRP to BIS data transfer via BSDs.
- The fourth and fifth bags inducted will be manipulated downstream of the EDS, such that they arrive in the CBRA as Unknown, and are then hand-scanned to check image/status data.
- When necessary, reinsert the eligible bag types into the Reinsertion subsystem to assess ID handling and reporting.
- The Bag Data Report (or similar) and Critical PEC Tracking Report will be reviewed for each bag to determine what IATA/RFID tracking information is retained and updated throughout the screening process and confirm that appropriate screening statuses are reported when the IATA/RFID tag is duplicated.

- Conditions that can result in a test fail rating include if any non-Clear bag misrouting occurs or an incorrect bag screening status causes improper Level 3 procedures at the CBRA (i.e., non-Clear bag recalled with a "Cleared" status and sent clear). The following conditions will not be grounds for test failure, but may result in a deficiency finding: 1) if the duplicate IATA/RFID is not detected and prevented from hand-off to the EDS; 2) incorrectly reported screening statuses; or 3) the wrong SVS image is presented.

Duplicated IATA/RFID Procedure 2 (Leading Cleared Bag):

- Five bags sharing the same duplicated tag data (using a different ID than used in Procedure 1) will be introduced to the CBIS with 5- to 10-second spacing and processed through the same EDS. A reprinted tag, cut tag, or use of IATA bingo tags are options for creating the IATA ID duplication. The IATA barcode sticker should be affixed to each bag in a location that will provide a high probability for a good read.
- The induction sequence will be Cleared, Alarmed, Cleared, Alarmed, and Cleared.
- Each non-Clear tracked bag will be handled normally in the CBRA, using BRP to BIS data transfer via BSDs.
- The fourth and fifth bags inducted will be manipulated downstream of the EDS, such that they arrive in the CBRA as Unknown, and are then hand-scanned to check image/status data.
- The Bag Data Report (or similar) and Critical PEC Tracking Report will be reviewed for each bag to determine what IATA/RFID tracking information is retained and updated throughout the screening process and confirm that appropriate screening statuses are reported when the IATA/RFID is duplicated.
- Conditions that can result in a test fail rating include if any non-Clear bag misrouting occurs or an incorrect bag screening status causes improper Level 3 procedures at the CBRA (i.e., non-Clear bag recalled with a "Cleared" status and sent clear). The following conditions will not be grounds for test failure, but may result in a deficiency finding: 1) if the duplicate IATA/RFID is not detected and prevented from hand-off to the EDS; 2) incorrectly reported screening statuses; or 3) the wrong SVS image is presented.

Test Iterations:

- Duplicate IATA/RFID Procedure 1, Leading Alarmed Bag
- Duplicate IATA/RFID Procedure 2, Leading Cleared Bag

Conclusion: At the conclusion of this test, the screening status and ID for all bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
12.7.1	CBIS Positive Bag Tracking Requirements
12.7.1.1	Pre-EDS Requirements (Items 1, 2, 5, 6, 7, 10)
12.7.1.2	Post-EDS Requirements (Items 1, 3)
12.13	CBIS Reporting Requirements
14.5.6.4	Order of Bag ID Lookup
14.6.2	BSD Statuses and High-Level Processing Procedures

D.2.8 Mixed Bag Line Test

Purpose: This test is conducted to verify the basic operation of the CBIS, specifically to ascertain if BHS tracking can properly handle multiple bags with differing decisions.

Procedure:

- A minimum of 20 bags (5 Suspect and 15 Clear) are introduced to the EDS from the BHS.
- The Bag IDs and EDS decisions are recorded at the EDS PVS, and the final status of the bags is recorded at the CBRA.
- Test bag quantities may be adjusted depending on the complexity of the CBIS.
- At the conclusion of this test, the screening status and ID for all test bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
12.3.2	Tail-to-Head Bag Spacing Requirement
12.7.1	CBIS Positive Bag Tracking Requirements
12.7.1.1	Pre-EDS Requirements (Items 1, 2, 4, 5, 6, 7, 9, 10)
12.7.1.2	Post-EDS Requirements (Items 1, 2, 3, 4, 5, 7, 8)
12.8.3	Divert and Merge Requirements
12.13.1	Reporting Frequency Requirement
12.13.2	Reporting Detail Requirements (all except Item 4)
12.13.3	Daily Reporting Requirements
14.6	Workstation Sequence of Operations

D.2.9 PLC versus Upper Level Sort Test

Purpose: This test is conducted to verify that the CBIS can track and screen bags via the PLCs independent of Upper Level Sort Systems.

Procedure:

- Prior to the start of the test, all PLCs controlling the CBIS must be disconnected from the sort controllers.
- A minimum of 20 bags (5 Suspect and 15 Clear) are introduced to the EDS from the BHS.
- The Bag IDs and EDS decisions are recorded at the EDS PVS, and the final status of the bags is recorded at the CBRA.
- Test bag quantities may be adjusted depending on the complexity of the CBIS. This test is conducted across one Spur Line per CBIS.
- At the conclusion of this test, the screening status and ID for all test bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections.

Section	Requirements Verified
12.7.1.1	Item 6: "CBIS tracking shall in no way be controlled or constrained by a sort controller where the relation is maintained within the PLC."

D.2.10 Clear Bag Bypass Test

Purpose: This test is conducted to verify the requirements of Section 7.2.6.1 to ascertain if the BHS has a Clear Bag Bypass feature and if so, that it is manually controlled and not automatic.

Procedure:

- **Part 1:** Ensure that the bypass feature is **NOT** enabled via the operator's workstation in the BHS control room.
  - A minimum of 20 bags (5 Suspect and 15 Clear) are introduced to the EDS from the BHS. Before inducting bags, disable any Clear Lines just past First Chance Diverters.
  - As bags are approaching the final chance divert, disable the Clear Line conveyor past the divert.
  - All Bags should proceed down the OSR Line past the first chance divert with Non-Clear bags proceeding to CBRA until the first Clear Bag approaches the divert. The first Clear Bag must cascade stop and NOT bypass the diverter on the Alarm Line to CBRA.
- **Part 2:** Ensure that the bypass feature **IS** enabled via the operator's workstation in the BHS control room.
  - A minimum of 20 bags (5 Suspect and 15 Clear) are introduced to the EDS from the BHS.
  - As bags are approaching the final chance divert, disable the Clear Line conveyor past the divert.
  - All bags should proceed into CBRA.
- At the conclusion of this test, the screening status and ID for all test bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
12.3.2	Tail-to-Head Bag Spacing Requirement
12.7.1	CBIS Positive Bag Tracking Requirements
12.7.1.1	Pre-EDS Requirements (Items 1, 2, 4, 5, 6, 7, 9, 10)
12.7.1.2	Post-EDS Requirements (Items 1, 2, 3, 4, 5, 7, 8)
12.8.3	Divert and Merge Requirements
12.13.1	Reporting Frequency Requirement
12.13.2	Reporting Detail Requirements (all except Item 4)
12.13.3	Daily Reporting Requirements
14.6	Workstation Sequence of Operations
7.5.3.1	Programming Logic

D.3 Detailed Testing

Detailed tests will be performed on all EDS spur lines and performed in multiple logical “tracking zones” on spur, mainline, and other lines. For the purposes of testing, these tracking zones are defined as follows:

- Zone 1: Point of acquisition of tracking to bag handoff to the EDS
- Zone 2: Bag handoff to the EDS and the first-chance diversion point
- Zone 3: Between the first- and second-chance diversion points
- Zone 4: Between the second-chance (or final) diversion point and the CBRA

During detailed testing, test bags are inducted from the point of acquisition of tracking through the EDS to the points of diversion to the Clear or outbound lines and into the CBRA, the STZ. Preferably, test bags should be inducted from their natural points of origin; deviations from testing in this final configuration will need to be approved by TSA in advance.

For specific tests, the induction and testing zones may be fewer than what is specified above and are noted as such in the Purpose or Procedure sections.

In the following sections, several references will be made to bag positioning. The following definitions apply to positioning:

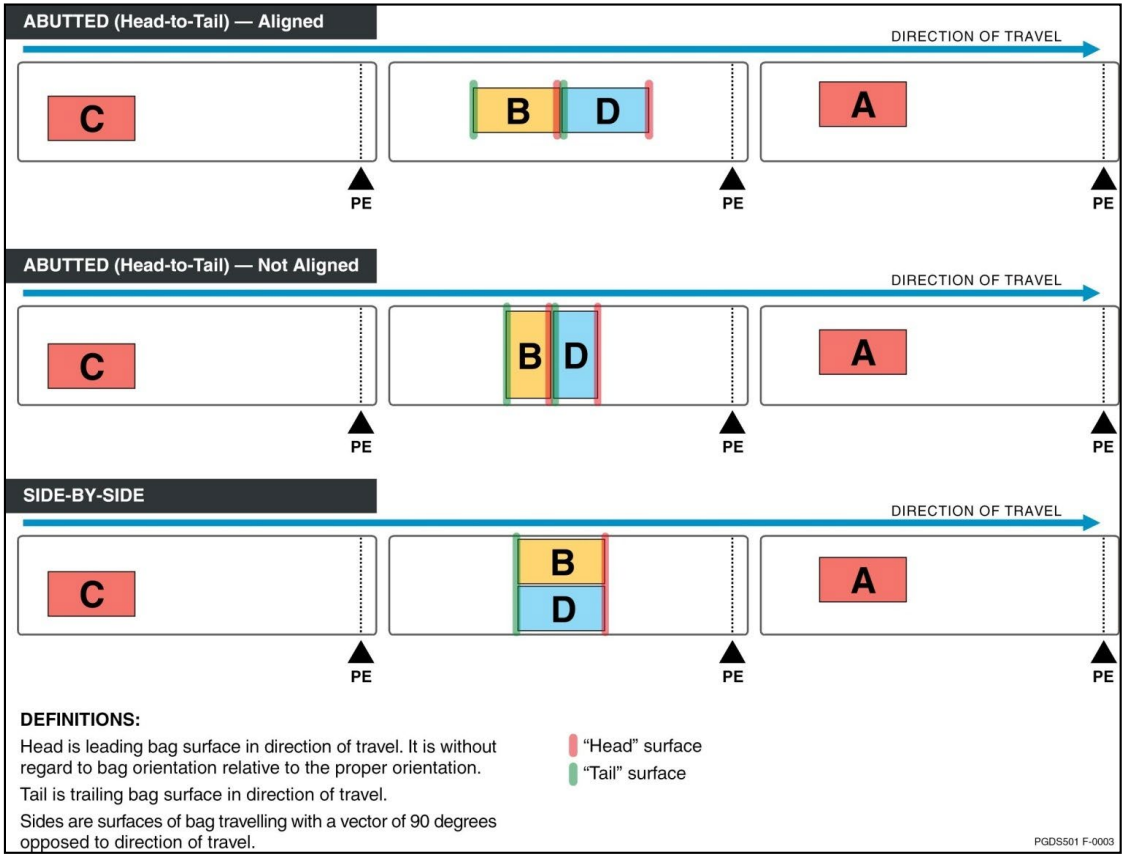
- Head is the leading bag surface in the direction of travel, without regard to proper bag orientation.
- Tail is the trailing bag surface in the direction of travel.
- Sides are surfaces of bag traveling with a vector of 90 degreed opposed to the direction of travel.

Problematic bag alignments include the following:

- Abutted head to tail aligned means that the head of the second bag is touching the tail of first bag and both bags are correctly aligned on the conveyor.
- Abutted head to tail not aligned means that one side of the first bag is touching a side of the second bag, and both bags are incorrectly aligned on the conveyor.
- Side-by-side means that the two bags are traveling side by side, and both bags are correctly aligned on the conveyor.

Refer to Figure D.1 for illustrations of problematic bag alignments.

Figure D.1: Problematic Bag Alignments



Common Requirements Verified: The list of verified requirements below is applied to all Section D.3 Tests unless specifically noted.

Section	Requirements Verified
12.3.2	Tail-to-Head Bag Spacing Requirement (unless specific test manipulations force below minimum spacing)
12.7.1	CBIS Positive Bag Tracking Requirements
12.7.1.1	Pre-EDS Requirements (Items 1, 2, 4, 5, 6, 7, 9, 10)
12.7.1.2	Post-EDS Requirements (Items 1, 2, 3, 4, 5, 7, 8)
12.8.3	Divert and Merge Requirements
12.13.1	Reporting Frequency Requirement
12.13.2	Reporting Detail Requirements (all except Item 4)
12.13.3	Daily Reporting Requirements
14.6	Bag Status
14.6	Bag Inspection Operations
14.6	Workstation Sequence of Operations

D.3.1 Removed Bag Test

Purpose: This test will be conducted to ensure that the BHS handles bags securely when one or more bags are removed from the system.

This test will be run in various sections of the tracking zones from the start of the STZ through the SF Lines, SS Lines, OSR Line and Alarm Line.

Procedure:

- A series of at least 10 bags (7 Clear and 3 Suspect) enters the EDS through the BHS.
- The bag IDs and EDS decisions are recorded at the EDS PVS and the final disposition of the bags is recorded at the CBRA. One or two bags are then removed from the baggage stream to simulate missing bags.
- At the conclusion of this test, the screening status and ID for all bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
D.3	See Section D.3 Common Requirements Verified

D.3.2 Delayed Bag Test

Purpose: This test will be conducted to ensure that the BHS handles bags securely when one or more bags are delayed outside their tracking windows.

Procedure:

- A series of at least 10 bags (7 Clear and 3 Suspect) enters the EDS through the BHS.
- The bag IDs and EDS decisions are recorded at the EDS PVS and the final disposition of the bags is recorded at the CBRA.
- Within each tracking zone from the start of the STZ through the SF Lines, SS Lines, OSR Line and Alarm Line, two nonconsecutive bags are held back within the baggage stream to simulate bags that slid outside their tracking windows.
  - In each test, one bag should be moved so that it does not interfere with the tracking window of any other bag, while the other bag should be moved so that it does interfere with the tracking window of another bag.
  - Tracking window interference includes the case where the trailing edge of a leading bag of minimum conveyable length (12”) is directly abutted against the leading edge of a trailing bag.
- At least one iteration of the Delayed Bag Zone 1 Test will be conducted creating abutted and spacing infringement conditions through the ATRs. This will include at least three variations to include: (A) both bags with IATA tags, (B) only leading bag with an IATA tag, and (C) only trailing bag with an IATA tag.
- At the conclusion of this test, the screening status and ID for all bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
D.3	See Section D.3 Common Requirements Verified
12.7.1.3	CBIS Detection Requirements

D.3.3 Accelerated Bag Test

Purpose: This test will be conducted to ensure that the BHS handles bags securely when one or more bags are accelerated outside their tracking windows.

Procedure:

- A series of at least 10 bags (7 Clear and 3 Suspect) enters the EDS through the BHS.
- The bag IDs and EDS decisions are recorded at the EDS PVS and the final disposition of the bags is recorded at the CBRA.
- Within each tracking zone from the start of the STZ through the SF Lines, SS Lines, OSR Line and Alarm Line, two nonconsecutive bags are accelerated within the baggage stream to simulate bags that slid outside their tracking windows.
  - Initiate each manipulation variation by first activating a BHS E-Stop in the tracking zone under test; then accelerate the bag as described before resetting the E-stop.
  - In each test, one bag should be moved so that it does not interfere with the tracking window of any other bag, while the other bag should be moved so that it does interfere with the tracking window of another bag.
  - Interference includes the case where the leading edge of a trailing bag of minimum conveyable length (12”) is directly abutted against the trailing edge of a leading bag.
- At the conclusion of this test, the screening status and ID for all bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
D.3	See Section D.3 Common Requirements Verified
12.7.1.3	CBIS Detection Requirements

D.3.4 Added Bag Test

Purpose: This test is conducted to ensure that the BHS handles bags securely when one or more bags are added to the system and to verify that added bags are not misdirected and that the tracking of other bags is not affected.

The Added Bag Test will primarily be applied to locations with greater potential for jam events or an increased vulnerability to human intervention, in particular EDS entrance conveyors and Fail-Safe bag insertion points.

Procedure:

- Review the system specific Jam Clearing and Jam Bag Handling Policy(ies).
- A series of at least 10 bags (7 Clear and 3 Suspect) enters the EDS through the BHS. The baggage induction can be staggered to allow two separate manipulations to occur and permit adequate bag spacing to ensure the added bag spacing distances defined herein can be accommodated.
- The bags' IDs and EDS decisions are recorded at the EDS PVS, and the final disposition of the bags is recorded at the CBRA.
- A jam event will be created by holding a bag over a PE. Alternately, blocking a PE is an option where creating the jam by holding a bag is not feasible or safe. The bags involved in the jam event will be removed and the jam condition cleared.
- Within the tracking zones described in the purpose statement above, two nonconsecutive bags that were removed from the jam event are added to the baggage stream to simulate added bags.
  - One bag should be added such that its leading or trailing edges are no closer than 15 inches to any other bag.
  - The second bag should be added such that either its leading or trailing edge is between 8 inches and 12 inches from another bag.
- At the conclusion of this test, the screening status and ID for all bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
D.3	See Section D.3 Common Requirements Verified
12.7.1.3	CBIS Detection Requirements

D.3.5 Bag Spacing Test

Purpose: This is a two-part test. The first part is conducted to determine if the CBIS delivers bags to EDS units in accordance with the OEM's Guidelines and Integration Manuals and PGDS Requirements. The second part is conducted to ensure that the CBIS routes bags securely if proper bag spacing into the EDS is not maintained.

No waivers will be issued for the Bag Spacing Test or the requirement for bag singulation into EDS units.

Procedure:

- **Part 1:** This test will be repeated across varying induction points until all SS Lines have been exercised.
  - A series of at least 10 bags (7 Clear and 3 Suspect) enters the EDS through the BHS.
  - The bags' IDs and EDS decisions are recorded at the EDS PVS, and the final disposition of the bags is recorded at the CBRA.
  - Tail-to-Head bag spacing is monitored and recorded at the EDS Entrance.
  - Bags are inducted from natural points of origin (i.e., Ticket Counters, Curbside Induction, and CBRA Re-Introduction).
  - Tail-to-Head bag spacing at induction will be maintained at 15 inches or greater except for two sets of two bags.
  - One set will have Tail-to-Head spacing of between 8 to 10 inches and the second set will be inducted with the tail and head abutted (zero gap).
  - Bags will then flow through the system and be directed to one EDS Spur Line per test iteration.
- **Part 2:** This test will be repeated for each SS Line.
  - Induct two bags just upstream of the start of STZ. Ensure these bags are close together, but separate at the point of induction such that final manipulation can occur.
  - Configure the BHS to send these two bags to a single SS Line.
  - Just as the leading bag is entering the immediate upstream queue conveyor from the EDS, force the second bag to become abutted to the first bag such that they enter the EDS together and in direct contact with each other.
- At the conclusion of both Parts of the Procedure, the screening status and ID for all bags processed are compared against the EDS status and bag IDs. In addition, at the conclusion of Part 1, the Tail-to-Head bag spacing will be compared against the EDS and PGDS required spacing.

Requirements Verified – (Part 1 and Part 2): The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
D.3	See Section D.3 Common Requirements Verified
-	OEM Bag Spacing Requirements

D.3.6 E-Stop Test

Purpose: This test will be conducted to ensure the ability of the EDS and BHS to activate and recover from E-Stops, and to maintain tracking of bags during E-Stop conditions. This test is to be conducted for both EDS and BHS E-Stops.

This test is to be conducted for each SS line.

Procedure:

- In the EDS E-Stop Test, a series of at least 10 bags (7 Clear and 3 Suspect) is sent to the EDS through the BHS.
  - When bags are in a position such that bags are leaving, entering, and within the EDS, an EDS E-Stop is activated.
  - The EDS must immediately disable its X-rays and the EDS conveyors should stop operating.
  - The BHS should recognize the E-Stop and halt any further bags from being sent to the EDS.
- In the BHS E-Stop Test, a series of at least 10 bags (7 Clear and 3 Suspect) is sent to the EDS through the BHS.
  - When bags are in a position such that bags are leaving, entering, and within the EDS, a BHS E-Stop is activated.
  - The EDS should recognize the E-Stop and prevent additional bags from being sent to the BHS.
  - Further, the system should not allow bags on EDS conveyors to be forced forward onto stopped BHS conveyors. An exception to the prevention of bags forced onto the BHS exit queue conveyor is permitted for the L3-6X00 EDS series due to known functionality when bags are present in the EDS scan plane (“B” conveyor) and exit tunnel (“C” conveyor). If observed, this condition will result in a Safety deficiency, but will not be a basis for issuing a “Fail” test result.
- At the conclusion of this test, the screening status and bag IDs for all bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
D.3	See Section D.3 Common Requirements Verified

D.3.7 Halt/Fail-Safe Test

Purpose: The purpose of this test is to ensure that the CBIS does not pass any non-Clear or unscreened bag to the outbound/sortation system. In addition, this test verifies that TSA is immediately notified of a Fail-Safe event, allowing an appropriate response.

D.3.8 Fail-Safe Operation for In-Line CBIS

Procedure:

- **Part 1:** The test is conducted with bags flowing normally through the CBIS in sufficient quantity such that bags are present from the EDS output through the Clear/Suspect bag diversion points.
  - At each Post-EDS diversion point between the OSR Lines and Clear Lines, force a non-clear bag to lose tracking between the decision photo eye upstream of the diverter and before the Fail-Safe photo eye on the OSR Line or Alarm Line by removing it from the system or preventing it from reaching the Fail-Safe photo eye.
- **Part 2:** The test is conducted with bags flowing normally through the CBIS in sufficient quantity such that bags are present from the EDS output through the Clear/Suspect bag diversion points.
  - At each Post-EDS diversion point between the OSR Lines and Clear Lines add a bag of greater than 12” in length directly abutted to the trailing edge of another bag prior to the bags leading edge reaching the decision photo eye upstream of the diverter.
  - The bag must be conveyed to CBRA with a Status of “Length Change”.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
12.9	Fail-Safe Operation
12.9.1	Fail-Safe Operation General Requirements
12.9.2	Fail-Safe Operation Requirements for In-Line CBIS

D.3.9 Fail-Safe Operation for Mini In-Line CBIS with a Manually Operated In-Line Decision Point

Procedure:

- Introduce a string of ten bags with one bag being a Suspect Bag followed by a Clear Bag.
- Render a late Alarm decision on the Suspect Bag and Clear the Clear Bag, run this test in Show All mode.
- Then force a non-clear bag beyond the last BRP onto the Clear Line.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
-	Verify that the Alarm/Clear combination with late decision does not activate the Halt condition.
12.9	Fail-Safe Operation
12.9.1	Fail-Safe Operation General Requirements
12.9.2	Fail-Safe Operation Requirements for a Manually Operated In-Line Decision Point CBIS

D.3.10 EDS Entrance Jam Recovery Test (Continuous Feed EDS only)

Purpose: This test will be conducted to evaluate the BHS to EDS communications and recovery processes when a bag jam occurs at the entrance to the EDS.

Procedure:

- Induct a series of 10 test bags (7 Clear, 3 Suspect) for transport to the screening line.
- After several bags have entered the EDS, hold a bag at the BHS PE adjacent to the EDS entrance tunnel until a jam condition is activated at the associated BHS control station. Alternately, the BHS PE adjacent to the EDS entrance tunnel may be shielded to simulate a bag jam condition.
- Record the PE Jam Timer (seconds) associated with the blocked PE.
- Remove bags involved in the jam event from the conveyors and reset the Jam Condition per local procedures and per EDS Integration Manuals (including removing bags from within the EDS if necessary).

- Confirm normal resumption of baggage screening by the EDS and BHS upon reset of the jam condition.
- Induct each bag removed during the jam event per local procedures and far enough upstream of the EDS to not interfere with BHS-to-EDS handshaking or BHS OOG detection located on the SS Lines.
- At the conclusion of this test, the screening status and bag IDs for all bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
12.7.1	CBIS Positive Bag Tracking Requirements
12.7.1.2	Post-EDS Requirements (Items 1, 2, 3, 4, 5, 7, 8)
12.8.3	Divert and Merge Requirements
12.13.1	Reporting Frequency Requirement
12.13.2	Reporting Detail Requirements (all except Item 4)
12.13.3	Daily Reporting Requirements
14.6	Bag Status
14.5	Bag Inspection Operations
14.5	Workstation Sequence of Operations

D.3.11 EDS Exit Jam Recovery Test (Continuous Feed EDS only)

Purpose: This test will be conducted to evaluate the BHS to EDS communications and recovery processes when a bag jam occurs at the exit of the EDS.

Procedure:

- Induct a series of 10 test bags (7 Clear, 3 Suspect) for transport to the screening line.

- After several bags have been processed through the EDS, hold a bag at the BHS PE adjacent to the EDS exit tunnel until a jam condition is activated at the associated BHS control station. Alternately, the BHS PE adjacent to the EDS exit tunnel may be shielded to simulate a bag jam condition.
- Record the PE Jam Timer (seconds) associated with the blocked PE.
- Remove bags involved in the jam event from the conveyors and reset the Jam condition per local procedures and per EDS Integration Manuals (including removing bags from within the EDS if necessary).
- Confirm normal resumption of baggage screening by the EDS and BHS upon reset of the jam condition.
- Induct each bag removed during the jam event per local procedures. If local procedures are to induct bags upstream of the EDS, then induct bags far enough upstream of the EDS to not interfere with BHS to EDS handshaking or BHS OOG detection located on the SS Lines.
- At the conclusion of this test, the screening status and bag IDs for all bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
12.7.1	CBIS Positive Bag Tracking Requirements
12.7.1.2	Post-EDS Requirements (Items 1, 2, 3, 4, 5, 7, 8)
12.8.3	Divert and Merge Requirements
12.13.1	Reporting Frequency Requirement
12.13.2	Reporting Detail Requirements (all except Item 4)
12.13.3	Daily Reporting Requirements
14.6	Bag Status
14.5	Bag Inspection Operations
14.6	Workstation Sequence of Operations

D.3.12 Decision Expiration Functionality Test

Purpose: This test is conducted to verify the basic operation of the CBIS when multiple non-Clear bags are screened sequentially, leading to OSR images being queued while awaiting an available PVS.

Note: This test applies only to systems designed with CT-80 series EDS equipment.

Procedure:

- Induct 10 consecutive non-Clear bags through a single EDS, utilizing an individual PVS.
- When each Suspect bag image is displayed on the OSR PVS, allow 80 to 90 percent of the available OSR time to expire prior to issuing a Clear decision status, using as a guide known EDS decision mode settings and declared BHS and EDS timeout settings. Repeat this procedure for all subsequent Suspect bags that appear at the OSR PVS.
  - Confirm that all bags are routed and displayed in accordance with the Level 2 decision issued by the EDS or OSR operator, or that they are routed to the CBRA if confirmed to be OSR timeout bags.
  - Record the CBRA arrival status for any bags that timeout awaiting an operator decision while in the EDS image queue and confirm that the status in use reflects PGDS Chapter 12, Section 9.2.2.3 and 9.2.3.3 Requirements.
  - Report any instances where EDS Clear decisions are issued and then accepted by the BHS after the bag is beyond the final decision point. If this condition exists, obtain information on the BHS Timer setting and functionality.
  - Report any instances where the EDS Errored status (or any EDS-assigned status) is displayed in the CBRA, with BHS report details confirming whether the status was EDS-issued.
  - Report any instances where the Unknown status is used. The Unknown status is only valid if the bag is lost in tracking OR the BHS does not receive a Level 1 or Level 2 disposition from the EDS, as confirmed through BHS reports.
- At the conclusion of this test, the screening status and ID for all test bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
12.7.1	CBIS Positive Bag Tracking Requirements
12.7.1.1	Pre-EDS Requirements (Items 1, 2, 4, 5, 6, 7, 9, 10)
12.7.1.2	Post-EDS Requirements (Items 1, 2, 3, 4, 5, 7, 8)
12.13.1	Reporting Frequency Requirement
12.13.2	Reporting Detail Requirements (all except Item 4)
12.13.3	Daily Reporting Requirements
14.6	Bag Status
14.5	Bag Inspection Operations
14.6	Workstation Sequence of Operations

D.3.13 Operational Test Kit Functionality Test

Purpose: This test is conducted to evaluate the ability of the CBIS to perform daily and shift-change OTK Functionality Tests efficiently and safely.

The OTK Functionality Test is conducted on each EDS line.

Procedure:

- Continuous Feed EDS
  - Record the specific steps taken to prepare the BHS for insertion of the OTK Test bag.
  - Begin to process no fewer than 10 bags (7 Clear and 3 Suspect).
  - While these bags are entering, leaving, and within the EDS, using available EDS and BHS controls, place the systems in OTK Test mode and record the results (Phase 1).
  - Conduct no fewer than three OTK Tests and record the results (Phase 2).
  - Record the steps necessary to process the OTK test bag, including insertion and removal procedures using the BHS and EDS controls.

  - Using the EDS and BHS controls, return the system to its normal mode of operation.
  - Complete the processing of the original 10 bags and record the results (Phase 3).

- Non-continuous Feed EDS
  - Record the specific steps taken to prepare the BHS for insertion of the OTK Test bag.
  - Completely process no fewer than 10 bags (7 Clear and 3 Suspect) in normal screening modes (Phase 1).
  - Using the EDS and BHS controls, place the system in the OTK Test mode.
  - Conduct no fewer than three OTK Tests and record the results (Phase 2).
  - Record the steps necessary to process the OTK test bag, including insertion and removal procedures using the BHS and EDS controls.
  - Using the EDS and BHS controls, return the system to its normal mode of operation.
  - Completely process no fewer than 10 bags (7 Clear and 3 Suspect) with the EDS and BHS configured for normal baggage screening mode (Phase 3).

Report any non-secure handling of the OTK Test bag or other test bags. Report any faults or system behaviors that require a BHS or EDS restart. At the conclusion of this test, the screening status and bag ID for all bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
7.2.9.1	OTK Test Requirements

D.3.14 Crossover Test

Purpose: This test is conducted to verify the CBIS crossover capabilities including bag tracking, orientation, and spacing when the crossover subsystem is engaged causing all bags to be transferred between SF Lines.

Note: The Crossover Test will be conducted unless the crossover functionality must be engaged manually or will engage only under extreme circumstances that cannot be expected during normal operations.

Procedure:

- A minimum of 40 bags (10 Suspect and 30 Clear) are routed through the EDS units through utilization of a crossover divert.
- The diversion device will be activated by CBIS cascade conditions, fault events, or through an HMI selection simulating such occurrences prior to the test.
- Bag IDs and EDS decisions are recorded at the EDS PVS, and the final status of the bags is recorded at the CBRA.
- Test bag quantities may be adjusted depending on the complexity of the CBIS.
- At the conclusion of testing, the screening status and ID for all test bags processed are compared against the EDS status and bag IDs.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
D.3	See Section D.3 Common Requirements Verified

D.4 System-Wide Testing

System-Wide Testing consists of two tests conducted across the entire CBIS, the Full Load Test and the System Throughput Test. Each System Test is tailored to stress the system in different ways. The Full Load Test measures performance when the system is under heavy load and conveyors have halted. Once dieback is released, it measures performance under normal non-stressed conditions. The System Throughput Test measures performance at or near Peak Load conditions.

Common System Test Requirements Verified:

Section	Requirements Verified
12.3	BHS Capacity
12.3.2	Tail-to-Head Bag Spacing Requirement
12.4	Screening Throughput Capacity Requirement (System Throughput Test only)
12.6	OSR Decision Time Requirements
12.7.1	CBIS Positive Bag Tracking Requirements
12.7.1.1	Pre-EDS Requirements
12.7.1.3	Post-EDS Requirements
12.7.1.3	CBIS Detection Requirements
12.8.3	Divert and Merge Requirements
12.8.12	Out-Of-Gauge Bag Requirement
12.9.1	Fail-Safe Operation General Requirements
12.9.2	Fail-Safe Operation Requirements for In-Line CBIS
12.9.3	Fail-Safe Operation Requirements for a Manually Operated In-Line Decision Point CBIS (Mini In-Line Systems Only)
12.11	Bag Jam Requirements
12.8.6	Recirculation Loop Requirement
12.8.7	Reinsertion Line Requirement

Section	Requirements Verified
12.8.8	Draft Curtains Requirement
12.13.1	Reporting Frequency Requirement
12.13.2	Reporting Detail Requirement
12.13.3	Daily Reporting Requirement
12.13.4	BHS ID Log Report Requirement
14.5	CBRA Functionality (All subsections)
14.6	Workstation Sequence of Operations (All subsections)

D.4.1 Full Load Test

Purpose: This test will be conducted to determine the ability of the system to properly track and handle bags during system-wide conveyor halt conditions and subsequent system restart.

Conveyable Item Characteristics: The baggage types included in this test will reflect projections in the BDR, BHS Specification, and CBIS-specific Bag Hygiene policies developed by the ILDT. Conveyable items used for this test will specifically include EDS OOG bags and tubs (totes) in projected percentages, as defined in the ILDT documents or as established by the TSA APM. The percentage of Alarm Bags must be 20 percent, or the amount dictated in the BDR.

Induction Location and Pacing: Primary induction locations at the first conveyor of ticket counter and curbside subsystems will be utilized (if available), with test bags allocated to these locations based on CBIS design documents and ILDT bag load projections. Induction pacing at the ticket counter inputs will use predetermined intervals and spacing that reflect individual and group check-in baggage loads. Induction intervals and spacing should be controlled to maintain a low to medium-paced processing rate. Secondary induction points may also be used with bag quantities corresponding to expected loads.

Level 2 and Level 3 CBIS Interface: Baggage ID and OSR screening decisions are recorded at PVSs (Level 2 inspection) and SVSs (Level 3 inspection) to support test data reconciliation. Operator actions at these locations will be simulated to reflect average baggage processing durations. The Level 2 Operators will permit 10 to 15 seconds of the bag viewing time to expire before rendering a Cleared or Alarmed status. Level 2 Operator decisions will not be rendered for one percent of the total bag volume, allowing these bags to “time-out” on the PVS display. The Level 3 inspection at the CBRA will incorporate CBIS bag handling processes, including an average processing time for Alarmed status bags at each BIS to simulate bags being inspected.

Induction Quantities:

- For In-Line CBIS, the ATSA Test team will determine the minimum quantity of test bags after system review.
- For Mini In-Line CBIS, and those with manual removal decision points, the minimum number of bags processed through each EDS line will be 200 bags. This increase in bags for Mini In-Line Systems is intended to increase the sample size.

Procedure:

- Induct as many Suspect bags (or force Suspect decisions on bags) as needed to completely fill the CBRA upstream through all primary and secondary decision points.
- Continue to fill the BHS with Mixed Decision Bags until the conveyors stop to either just before the EDS or to the start of tracking. This condition is defined as "dieback."
- Once the dieback condition through the screening lines have cleared, resume bag induction at a slow to medium pace. The CBIS should not re-enter a CBRA initiated dieback state for the remainder of the test.
- The second part of the test after dieback has been released will evaluate the CBIS performance at low to medium baggage processing rates (10 to 50 percent of design rate). Baggage induction pacing and locations, conveyable item characteristics, and Operator screening processes at Level 2 and Level 3 inspection interfaces are simulated to establish a baseline of CBIS performance capabilities under non-peak screening conditions.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
D.4	See Section D.4 Common Requirements Verified

D.4.2 System Throughput Test

Purpose: The System Throughput Test will be conducted to demonstrate the ability of the CBIS to operate under conditions at or approaching peak throughput rates and to evaluate the PGDS Screening Throughput Capacity requirement.

Procedure: The Throughput will be measured at each EDS using the EDS FDRS Reports. In the event of a problem with the reports develops, the Throughput may be measured using BHS Reports and Timestamps of bags seen at the closest PE upstream of the EDS entrances. Configure the CBIS to only screen baggage through non-redundant EDS. Staff CBRA sufficiently to prevent any restriction on processing rate. Immediately prior to starting the test, reset/calibrate EDS in attempt to prevent auto-calibrations from occurring during the test. Preload the ticket counter, curbside,

and interline transfer lines (and any other input lines) selected for the test by disabling the mainlines just upstream of security tracking start via motor disconnect. Once inputs are filled to the load points, deactivate motor disconnects and commence the test.

- Process bags correctly through the CBIS such that:
  - Clear bags are sent directly to the outbound sortation system.
  - Suspect bags are sent directly to the CBRA, and once cleared, are sent to the outbound sortation system.
  - Faulted, mis-tracked, and error bags are sent to the CBRA.
  - Induction Location and Pacing: Induct baggage as fast as the system will allow, while not violating system-required minimum bag spacing.
- **Induction Quantities:** The ATSA Test team will determine the minimum quantity of test bags after system review.
- If technically possible, and working with the EDS vendor, configure the CBIS to save all bag images. In this way, when reconciling the test data, any CBRA anomalies can be more thoroughly investigated by examining the EDS and BHS data logs and all saved images.
- Using available inputs (e.g., ticket counters, curbside, and transfer lines), induct a mix of bags (Suspect/Clear) as fast as the system will allow while not violating system-required minimum bag spacing. Process a mix of bags (Alarmed/Clear) and for testing purposes, Clear 50% of the Alarmed Bags through OSR. The CBIS must be in its final configuration as a pre-requisite of this test and it cannot be performed until no construction constraints preventing induction at the normal points of origin remain.
- During the test, personnel will not prevent bag jams from occurring. Only after bag jams occur will personnel clear the jams. The location of each bag jam will be recorded along with any observations that will help reduce the jam rate.

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
D.4	See Section D.4 Common Requirements Verified
-	System Throughput will be evaluated using the rates outlined in the BDR.

D.5 Operational Run-In

Purpose: The Run-In Period will be performed after a minimum of 2 weeks of normal TSA operations. This 2-week cool-down period will allow the team to become familiar with the system and comfortable with the operating procedures. After the ISAT, a data analysis plan will be provided to the ILDT/airport within 5 days, outlining the data that will need to be collected. Upon completion of the 2-week cool-down period, a 2-week period of meaningful operational data (BHS and EDS) will be collected and analyzed. If this data is consistent and it is the determination of the Regional

Deployment Coordinator (RDC) and Acceptance Test, the data collection effort will terminate and the Test Summary Report (TSR) will be drafted. If the data shows anomalies, then another two-week data collection period will be initiated.

The Run-In period may be extended or shortened at TSA direction based on the analysis of the collected data. If TSA-requested data is not received within 10 calendar days from request, the TSR may be issued as a "Fail".

Requirements Verified: The performance of the system is judged against the requirements set forth in the following PGDS Sections:

Section	Requirements Verified
12.3	BHS Capacity
12.4	Screening Throughput Capacity Requirement
12.7.1	CBIS Positive Bag Tracking Requirements
12.7.1.1	Pre-EDS Requirements
12.7.1.2	Post-EDS Requirements
12.7.1.3	CBIS Detection Requirements
12.8.4	Round Robin BAM
12.9.1	Fail-Safe Operation General Requirements
12.9.2	Fail-Safe Operation Requirements for In-Line CBIS
12.9.3	Fail-Safe Operation Requirements for a Manually Operated In-Line Decision Point CBIS (Mini In-Line Systems Only)
12.11	Bag Jam Requirements
12.8.6	Recirculation Loop Requirement
12.8.7	Reinsertion Line Requirement
12.8.8	Draft Curtains Requirement
12.13.1	Reporting Frequency Requirement
12.13.2	Reporting Detail Requirement
12.13.3	Daily Reporting Requirement

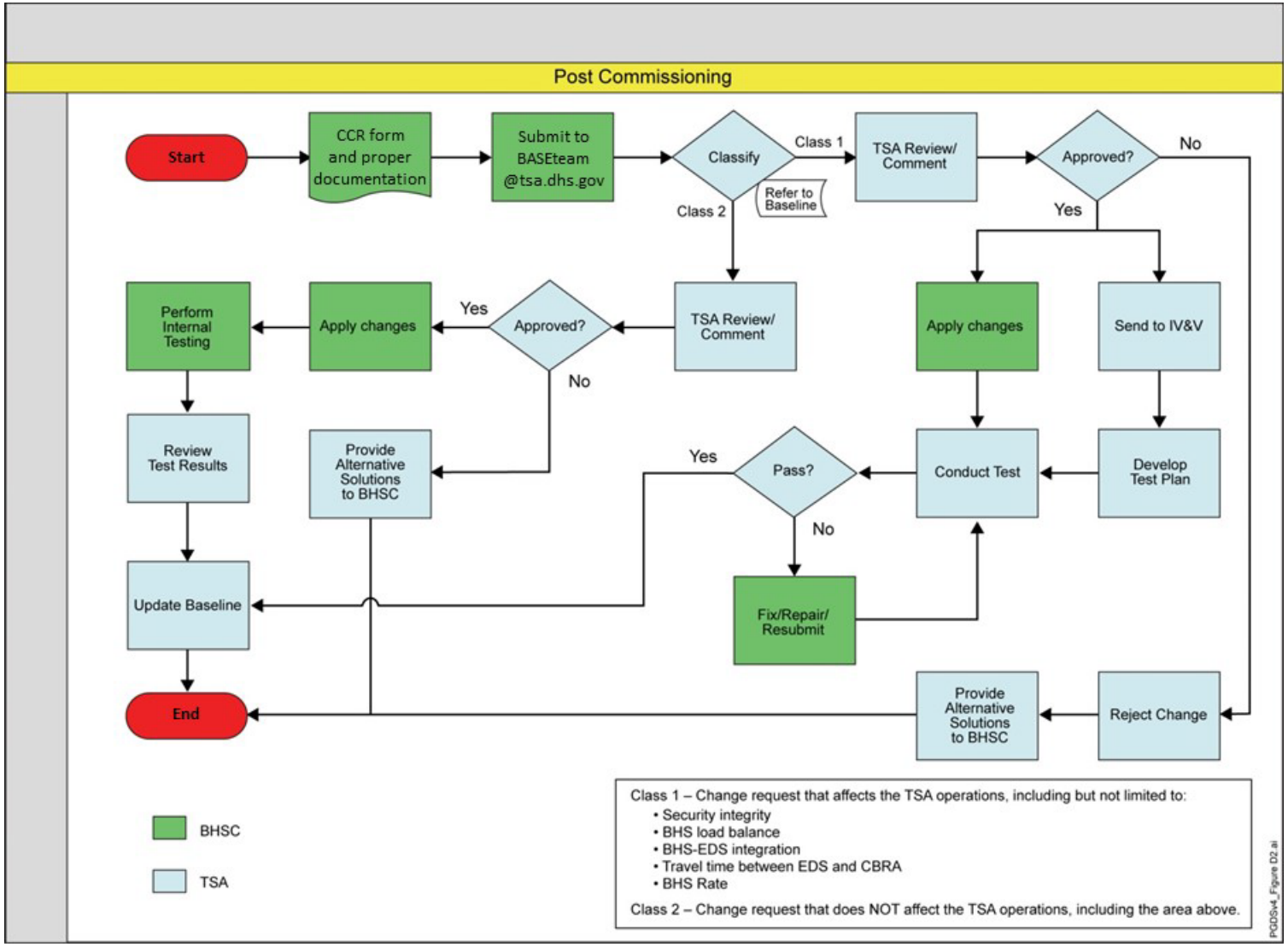
Section	Requirements Verified
12.13.4	BHS ID Log Report Requirement
14.5	CBRA Functionality (All subsections)
14.6	Workstation Sequence of Operations (All subsections)

D.6 Post-Commissioning Requirements

All proposed PLC or computer code changes to the CBIS must be submitted to the TSA using the CBIS change request form as shown in Figure A.8. Overall, the change request process consists of three steps: 1) The BHSC develops the proper documentation, completes the change request form, and submits it to the TSA; 2) TSA receives, reviews, and provides disposition to the change request; and 3) BHSC implements the change and supports the verification of successful implementation as tested by the TSA designated entity.

A detailed block diagram outlining the roles of the BHSC and the TSA, as well as the detailed steps required to complete the process, is shown in Figure D.2. It is essential for the continued secure and efficient operation of the CBIS that changes to the system are evaluated, reviewed, and approved by the TSA before they are implemented. A Configuration Management (CM) process has been established and must be followed throughout the lifecycle of the CBIS. Related documentation and requirements are found in Appendix A, Section A.8 (Configuration Management Process).

Figure D.2: CBIS Configuration Management Process



APPENDIX E:

CONTINGENCY PLAN EXAMPLES

This appendix provides two examples of Contingency Plans developed for the CBISs at Chicago O'Hare and Myrtle Beach International Airport. The Contingency Plan is intended to: (1) identify all likely scenarios for system or component failure that may occur during operation of the CBIS, and (2) describe the protocols and procedures to be followed by BHS control, the airlines, and the Transportation Security Administration when these scenarios occur. This appendix has been updated based upon lessons learned and new requirements.

Sources: Contingency Plan for Chicago O'Hare United Airlines B-South EDS Project provided by BNP Associates, Inc. (reproduced and reformatted with permission); Contingency Plan for Myrtle Beach International Airport provided by BNP Associates, Inc. (reproduced and reformatted with permission).

APPENDIX E-1:
UNITED AIRLINES ORD B-SOUTH EDS PROJECT CONTINGENCY PLAN

Issued for: TSA 100% Submitted

By: BNP Associates, Inc.

13 August 2010

REVISIONS

Version	Description of Version	Date Completed
0.1	Initial draft submitted to TSA	08-13-10

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ACRONYMS AND ABBREVIATIONS

AS shall mean Alaska Airlines
BHS shall mean Baggage Handling System
BMA shall mean Baggage Measuring Array
CB shall mean Clear Bag Subsystem
CBIS shall mean Checked Baggage Inspection System
CBRA shall mean Checked Baggage Resolution Area
CCB shall mean Configuration Control Board
CF shall mean Component Folder
CI shall mean Configuration Identification
CM shall mean Configuration Management
CMP shall mean Configuration Management Plan
CR shall mean Change Request
EDS shall mean Explosive Detection System (Computer Tomography)
ER shall mean Engineering Request
ETD shall mean Explosive Trace Detection
FIS shall mean Federal Inspection Service
HSD shall mean High Speed Diverter
LAX shall mean Los Angeles International airport
OSR shall mean On-Screen Resolution
PGDS shall mean Planning Guidelines and Design Standards
SB shall mean Suspect Bag Subsystem
SVS shall mean Secondary Viewing Station
TSA shall mean Transportation Security Administration

E.1 Contingency Plan for United Airlines B-South EDS Project, Chicago O'hare International Airport

E.1.1 Introduction

This site specific version of the Contingency Plan is for the Concourse B-South CBIS located at the Chicago O'Hare International Airport. In accordance with the TSA Planning Guidelines and Design Standards, V3.0 dated 27 November, 2009 this document outlines a contingency plan for the procedures and notification requirements applicable for equipment failures, loss of power and unplanned surges in system demand etc. in the B-South system.

The contingency plan attempts to identify O & M activities for failure mode operations (automatic or manual), documenting and informing relevant parties of changes to the BHS after system failure that have an impact on the processing baggage. The contingency plan does not address general mechanical maintenance, where equipment is replaced, as this work is generally assumed to not have any impact on the BHS operation.

The success of any automated Checked Baggage System Inspection System (CBIS), regardless of the redundancies built into a particular system, rest with the creation of a Contingency Plan (CP) that is agreed upon by key stakeholders, including United Airlines, any second part O&M Contractors, and the TSA (Local and HQ).

E.1.1.1 Purpose

The following are overview topics for Contingency Plan consideration and "triggers" that would initiate contingency operations in the event of.

- Screening equipment failure
- Conveyance equipment failure
- Loss of utility power
- Unplanned surges in system demand
- Temporary alternative screening locations for baggage
- Removal of threat "Suspect" bags from the CBRA
- Threat evacuation and associated impact on baggage screening
- Airport Operations Emergency Response Plan
- TSA local standard operating procedures
- United Airlines / O'Hare Emergency Incident Response Plan

E.1.2 BHS Overview

E.1.2.1 CBIS Overview

The B-South CBIS layout is based on the design standards and practices detailed in the TSA Planning Guidelines and Design Standards (PGDS) Version 3.0, as coordinated between the TSA, United Airlines and the BNP Design Team. The proposed design is also consistent with United Airlines intent to provide a remote screening facility to process all Canadian transfer bags and to provide a secondary EDS system to screen a configurable percentage of outbound originating baggage.

The 14520 BHS Specification details the complete system, equipment to be provided and the functional description of operation.

The purpose of the reconfiguration of the South EDS area is to facilitate an in-line integrated EDS screening process for “Hot-Bag” and “Cold Bag” transfers.

The reconfigured IB1 conveyor line will be utilized as a ”Cold-Bag” transfer input to the EDS matrix for screening. A new (EX1)”Expedited Bag” transfer input will be provided to transport “Hot” transfer bags to the new CBIS area for screening.

The new CBIS mainline (EDS3) shall consist of four (4) integrated L3 6600 EDS devices X9, X10, X11 and X12 for the screening of the transfer bags. The system design is based off of the N+1 method by which three (3) of the EDS machines are installed to handle the peak baggage demand of the average day peak month the airport will experience with the fourth EDS device installed as redundancy.

A new scanner array (ATR) shall be installed on the EDS mainline EDS3. Once cleared bags have been merged back onto EDS3, after screening, the associated ten digit IATA bag tag shall be read by the array and will correlate the bag tag with the associated outbound flight departure information time in order to determine if it will be treated as a “Cold Bag” or a “Hot Bag”. If it is determined to be a “Cold Bag” then the bag will be diverted onto the CB9 subsystem for transport into the existing Terminal One outbound BHS for sortation. If it is determined to be a “Hot Bag” then it will be diverted onto the EX2 subsystem run out conveyor for immediate transport to its associated flight. If the bag is pending a decision or has been alarmed, it will be transported to the CBRA for Level 3 ETD screening. Cleared “hot bags” will be re-inducted onto the CB7 clear bag line where they will be read by the CB7 ATR. If the system determines the bag to be “hot” it will be diverted to the CB8 clear bag line which merges back onto the EX2 run out conveyor.

Any bags that cannot be cleared at Level 1 or Level 2 (OSR) will be transported into the CBRA for further processing (Level 3 ETD screening). Once the bag has been cleared it will be placed on the CB7 subsystem for transport to the existing Terminal One outbound BHS for sortation.

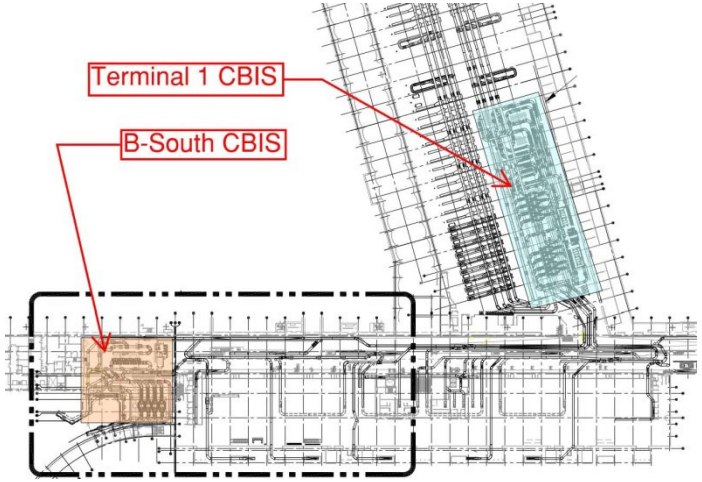
Any bags that receive an EDS “unknown” status in the CBRA can be re-introduced to the EDS mainline via the RI subsystem according to local TSA protocols. The CBIS is considered to be tracked from the first ATR location located along TX1A, and at the EDS3-1 conveyor when the IB1 RI1 and EX1 merge together onto the EDS mainline. The tracked subsystems continue through the EX2 decision point, the CB8 decision point and into the CBRA room. Any modification to the PLC program affecting these areas needs to be approved and coordinated with TSA.

E.1.2.2 Screening Methodology Overview

The 100% In-Line integrated EDS configuration for this project will consist of three (3) Screening Level classifications which are as follows:

Level 1 – EDS screening in the "Automatic" mode:

All originating "in-gauge" checked bags shall be routed to an EDS device for security screening. The EDS device software will automatically scan each bag. The EDS device will provide a status for the bag "clear" or 'unclear' based on the assessment of the images and notify the BHS via the EDS/BHS interface. "Clear" level 1 "Cold Bags" will be routed to the sortation system using the CB9 subsystem. "Clear" level 1 "Hot Bags" will be routed to the EX2 runout conveyor for immediate transport to its flight.



Level 2 – On Screen Resolution (OSR) operation:

Baggage that receives a "Unclear" status from the level 1 EDS device will have the suspect image delivered via the security interface network to the EDS security monitoring area (level 2). The images shall be received and displayed on monitors in the OSR control room. An operator will view the image in the display for a configurable time duration utilizing Threat Resolution Tools (TRT) to determine if the bag is "Clear" or "Unclear". If the operator determines that the bag is suspect or the allocated time period expires (minimum of 45 seconds), and no decision has been rendered, the image and relevant bag will be given an "Unclear" level 2 status. These bags shall be transported into the CBRA on the SB4 line for review and appropriate handling.

Level 3 Explosive Trace Detection (ETD) operation:

Bags with “Unclear” level 2 or “Out of Gauge” status will be transported to the CBRA for further inspections and appropriate handling (ETD). “Clear” Level 2 bags will be placed on the CB7 conveyor subsystem. “Clear” Level 2 “Cold Bags” will be routed to the sortation system using the CB9 subsystem. “Clear” Level 2 “Hot Bags” (determined by a new ATR located upstream of the CB8 diverter) will be diverted to the CB8 subsystem and routed to the EX2 run out conveyor for immediate transport to its flight.

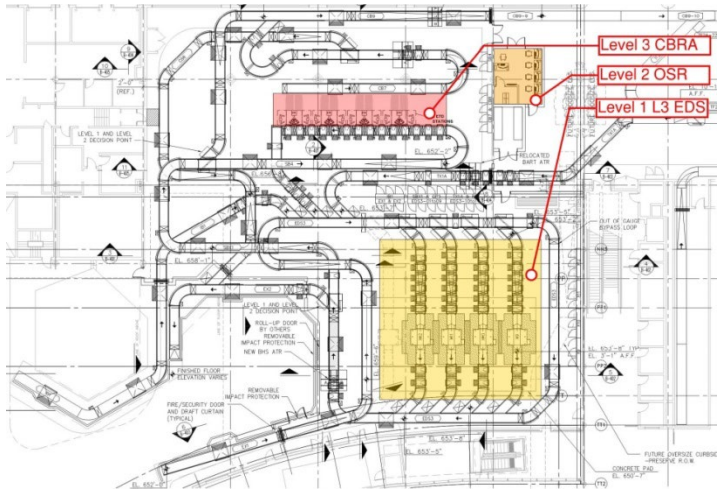
All “Failed” level 3 bags shall be handled per the local EOD protocol. Full access is provided into the CBRA to allow for any required LEO explosive robot to maneuver as required to eliminate the potential threat.

E.1.3 Objectives of the Contingency Plan

E.1.3.1 Contingency Plan Implementation Risk

In the event the CBIS becomes inoperative due to any event which prevents the CBIS from processing baggage in a designed timely manner a contingency plan developed for that event will be implemented.

This plan, dependent on the critical nature and size of event, would require multiple parties to communicate in a timely and efficient manner. If the plan is not implemented properly or promptly, and event that already has degraded the system will only become more compounded and take a longer duration to alleviate.



E.1.3.2 Desired Outcomes

The Desired outcome of implementing a contingency plan is to screen as many bags as possible in the shortest time possible despite an event in the system that would be preventing this operation. A contingency plan would remain in place until the system has reverted to its original state and all the events / faults have been mitigated and corrected.

E.1.3.3 Potential Impacts

If an event that creates a sever long term downtime situation occurs, United Airlines would be required to quickly and effectively modify their operation to ensure all outbound and transfer baggage are still processed in a timely manner. In most B-South extreme duration failure incidents the baggage inducted onto the MOD1 and MOD2 ticketing counters will be re-routed to the existing basement EDS system. All transfer bags would be loaded onto alternate input points to route all transfer bags to the existing basement EDS. All bags that normally would be inducted onto the curbside lines (inputs CS1 and CS2) would need to be manually carted to another active input location that feeds into the existing basement EDS.

E.1.3.4 Recourse Requirements

TSA should be have in place a dynamic agent deployment plan to provide any extra staffing inside the CBRA room in the event an unexpected flood of bags is routed to the CBRA. This could be caused by multiple EDS device faults or in the event the clear bag mainline of the decision point diverter has an extended duration fault.

E.1.4 Contingency Plan – CBIS Failures and Resolutions

The following is a preliminary contingency plan for ORD B-South BHS and will be updated by the BHS Contractor based on their functional specification and updated throughout the Construction Phase.

E.1.4.1 General

It should be noted that for any failure of a system component in the B-South CBIS or CBRA that is determined to cause an extensive period of downtime or a severe reduction in throughput capacity, the response team can choose to prevent any bags from being routed to the disabled B-South system by changing the conveyor direction of the MOD1 and MOD 2 ticket counter conveyors. Any unscreened or suspect stranded bags in the B-South system will need to be found, unloaded and transported to an appropriate input into the existing Terminal 1 CBIS. Any clear bags stranded on the clear bag mainline out of the B-South system will need to be recovered and inducted onto a functional input into the sortation system downstream of the B-South system.

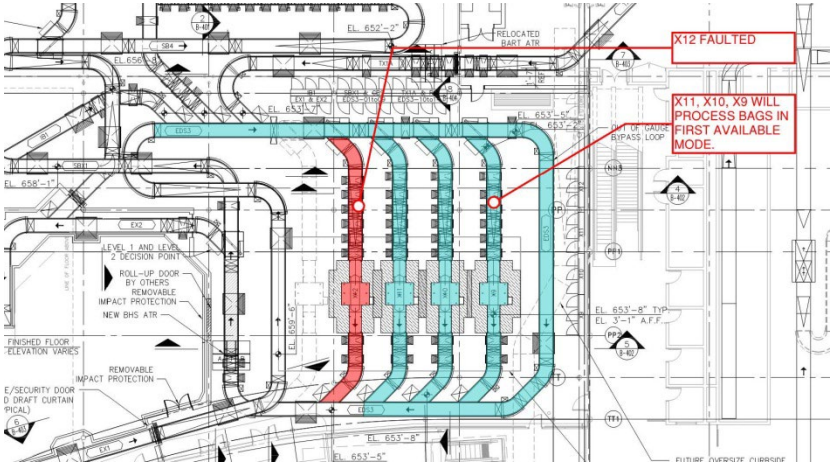
E.1.4.2 Unavailable EDS Line

E.1.4.2.1 System Response

- The HSD that feeds the affected ED subsystem will automatically be placed in the “divert none” mode by the control system.
- Any bags inside the L3 at the time of the fault will be tracked to the CBRA with an EDS “error” status and manually re-inducted into the system from the CBRA utilizing the Re-insertion Subsystem (RI1).
- Throughput capacity is still realized utilizing the PGDS N+1 requirement which will allow the system to still process its peak demand despite the faulted EDS unit.

E.1.4.2.2 Maintenance Response

- In the event an EDS line is unable to process bags (L3 EDS failure, or BHS conveyor failure), the stranded bags upstream of the EDS device will be manually transferred to the adjacent EDS line (X9, X10, X11, or X12) upstream of the faulted screening device. These bags will be assigned a BHS Pseudo ID at a photocell on the queue conveyor upstream of the EDS device that will be associated with the status assigned by the L3 after Level 1 screening.
- Any removal of bags from any TSA supplied equipment (e.g., L3 6600 EDS device) may only be performed by TSA Staff.



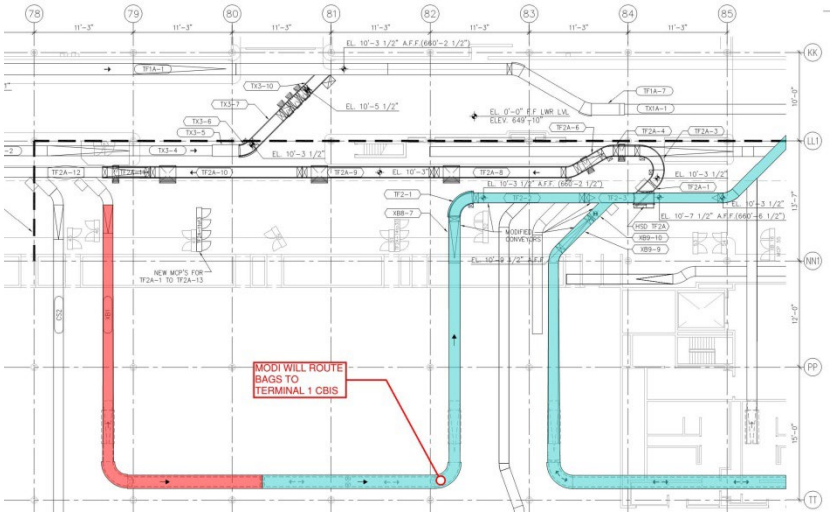
E.1.4.3 Unavailable EDS Mainlines (EDS3) Medium/Extended Duration

E.1.4.3.1 System Response

- In the event the EDS3 mainline feeding the X9 through X12 security shunt lines becomes disabled, the system will alert the Central Control Room.
- All baggage that is downstream of the failed subsystem will be processed to the clear bag lines or routed to the CBRA room as normal.

E.1.4.3.2 Maintenance and Operations Response

- The UAL O&M group will re-direct the direction of the MOD1 and MOD2 ticketing conveyors to route all outbound baggage to the Terminal 1 CBIS.
- All transfer bags will have to be inducted into the existing Concourse B-C Connector BHS at an existing transfer inputs.
- All bags stranded upstream of the disabled EDS3 mainline will be manually removed and carted to a functioning input point to induct bags into the Terminal 1 CBIS.



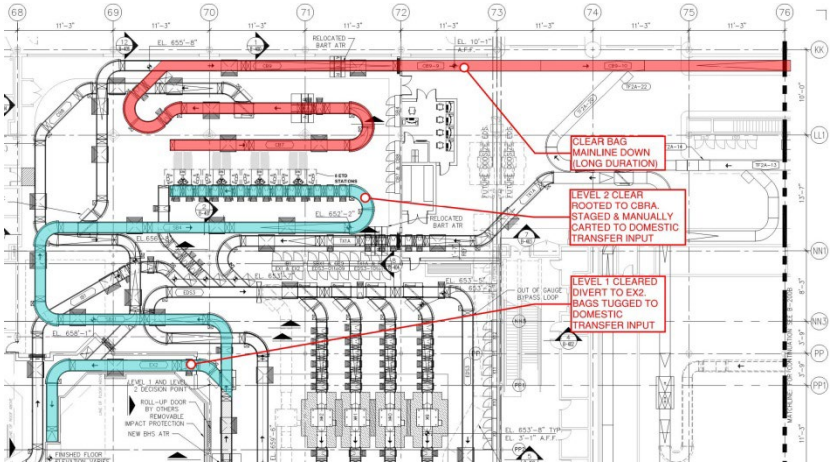
E.1.4.4 Clear Bag Mainline Failure Medium/Long Duration

E.1.4.4.1 System Response

- System will alert the Terminal 1 Central Control Room.
- All clear bags immediately cleared by the Level 1 EDS will be diverted to the EX2 pier (for long duration failures). This fallback procedure will only be initiated by UAL O&M within the Terminal 1 Control Room.
- The system will prevent any bags from being routed to the B-South CBIS. All originating bags will be conveyed to the Terminal 1 CBIS.

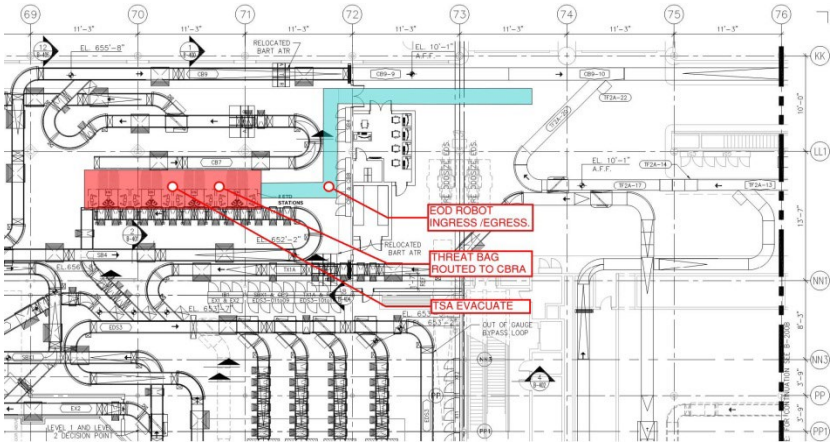
E.1.4.4.2 Maintenance and Operations Response

- If the failure is a long duration failure Operations will be notified that clear bags will need to be transported from the EX2 expedited hot bag pier and re-input into the Terminal 1 sortation system through a domestic transfer input.
- All clear bags from the CBRA will be manually carted to an existing domestic transfer input to transport the clear bags to the Terminal 1 sortation system.
- All stranded bags on the clear bag mainline will be manually removed and input onto a domestic transfer input.



E.1.4.5 Treatment of Positively Identified Threat Bags by TSA Staff

- When TSA staff cannot clear an alarmed bag following Standard Operating Procedures (SOPs) they shall contact the Airport Manager on Duty (MOD) as well as the Airports Designated Law Enforcement Officer (LEO) for resolution of the Identified Threat.
- The Designated Law Enforcement Officer (LEO) then assumes full responsibility of the threat bag and his/her standard operating procedure shall be followed.
- An accessible route has been provided for to allow for any EOD robot access in and out of the CBRA where the threat bag will be located.



E.1.4.6 B-South OSR Failure

E.1.4.6.1 System Response

- If the B-South OSR stations (MUX failure/fault) become disabled, the remaining bags on the system that are not cleared by the EDS will be routed to the CBRA for Level 3 processing.
- The system will also prevent the MOD1 ticket conveyor from transporting any additional bags to the B-South CBIS. The conveyor will stop and change directions to feed the existing Terminal 1 CBIS located between Concourses B and C.

E.1.4.7 Decision Point HSD Failure

- If the decision point HSDs become inoperable (either the EX2 or the CB9 diverter), the diverters will need to be manually opened and locked in that position during operations. All bags either clear or alarmed will be routed to the CBRA room for reconciliation. Clear bags will

be indicated at the CBRA removal queue conveyors on the BSD (baggage status displays). These bags can immediately be transferred to the CB7 clear bag line. All suspect, unknown, lost in tracking bags will be handled normally, or per local TSA SOP.

- If the diverter is unable to be locked open, additional UAL staffing will be required to manually remove the stranded bags upstream of the diverter and load onto an operating conveyor downstream of the diverter. These bags will NOT be reinserted into the system from the CBRA. The TSA will be aware of the system fault condition and will reconcile the bags in the CBRA.

E.1.4.8 CBRA Equipment Failure

- If the BSDs located in the CBRA room become inoperable, all bags will have to be searched manually, or as directed by local ORD TSA protocol. Additional staff will be required if necessary to process the bags. TSA will need to coordinate with the BHS Control Room to ensure that originating checked bags be routed to the Terminal 1 CBIS and that any hot or cold transfer bags be input onto another transfer input to the Terminal 1 CBIS.

E.1.4.9 Transfer Input Failure

- In the event of a failure of IB1 or hot bag EX2 transfer input failure, United will still be able to induct bags on the alternate transfer input line or if both input lines are disabled, alternate transfer input points are available that route bags to the basement EDS.

E.1.4.10 Out of Gauge Subsystem Failure or BMA Failure

- In the event the BMA (baggage measuring array) becomes faulted for an extended period of time, the system will continue to sort bags to a security line X9 through X12. The BHS Control Room will be made aware of this event and should provide additional manpower to staff the entrance of the EDS devices to ensure bags too large to be processed by the Level 1 machines are removed so as not to cause damage to the machines or create a jam event.

E.1.4.11 Power Loss

- In the event of a system power loss, an Uninterruptible Power Supply (UPS) will allow the PLCs to retain all tracking data for a minimum of two (2) hours.
- The UPSs provided for the L3 devices (if purchased) will allow for a controlled shut down of the x-ray gantry and screening computers.
- In the event any power failure results in an extended duration of the non-operable B-South system, TSA and UAL will proceed with fall back operations currently in place and initiated by UAL.

E.1.4.12 Unplanned Surge in System Demand

- Surge in system demand is handled by the redundant N+1 L3 6600 EDS device[1]. Additionally the system can be metered to only send a certain percentage of originating baggage to the B-South CBIS, if B-South becomes to overloaded a smaller percentage of bags can be routed off.

[1] The TSA notes that although the redundant EDS machine may make it feasible to handle a larger overall baggage rate, the redundant EDS machines are supplied to support operational availability.

APPENDIX E-2:
MYRTLE BEACH INTERNATIONAL AIRPORT (MYR)
IN-LINE BAGGAGE SCREENING
CONTINGENCY PLAN

Issued for: TSA 100% Submitted

By: BNP Associates, Inc.

21 September, 2011

REVISIONS

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ACRONYMS AND ABBREVIATIONS

AL shall mean Alarm Line Subsystem
AOA shall mean Airport Operations Authority
ATR shall mean Automatic Tag Reader
BHS shall mean Baggage Handling System
BMA shall mean Baggage Measuring Array
BNP shall mean Baggage Consultant for MYR
CBIS shall mean Checked Baggage Inspection System
CBRA shall mean Checked Baggage Resolution Area
CD shall mean Claim Device
CL shall mean Clear Line Subsystem
EDS shall mean Explosive Detection System (Computer Tomography)
ETD shall mean Explosive Trace Detection
HSD shall mean High Speed Diverter
IB shall mean Inbound Baggage System
MYR shall mean Myrtle Beach Airport Authority
MU shall mean Make Up
O&M shall mean Operations and Maintenance
OOG shall mean Out Of Gauge
OSR shall mean On-Screen Resolution
PGDS shall mean TSA's Planning Guidelines and Design Standards
PLC shall mean Programmable Logic Controller
RI shall mean Reinsertion Line
SAC shall mean Sortation Allocation Computer
SL shall mean Sortation Line Subsystem
SS shall mean Security Screening Subsystem
SVS shall mean Secondary Viewing Station
TC shall mean Ticket Counter Subsystem
TSA shall mean Transportation Security Administration
TSO shall mean Transportation Security Officer (Baggage Screener)
VMU shall mean Vertical Merge Unit
VSU shall mean Vertical Sorter Unit

E.2 Contingency Plan for Myrtle Beach International Airport In-Line Baggage Screening

E.2.1 Introduction

This site specific version of the Contingency Plan is for the new Medium Volume In Line EDS system located at the Myrtle Beach International Airport. In accordance with the TSA Planning Guidelines and Design Standards, V3.0 dated 27 November, 2009 this document outlines a contingency plan for the procedures and notification requirements applicable for equipment failures, loss of power and unplanned surges in system demand etc. in the CBIS.

The contingency plan attempts to identify O & M activities for failure mode operations (automatic or manual), documenting and informing relevant parties of changes to the BHS after system failure that have an impact on the processing baggage. The contingency plan does not address general mechanical maintenance, where equipment is replaced, as this work is generally assumed to not have any impact on the BHS operation.

The success of any automated Checked Baggage System Inspection System (CBIS), regardless of the redundancies built into a particular system, rest with the creation of a Contingency Plan (CP) that is agreed upon by key stakeholders, including MYR, any second part O&M Contractors, and the TSA (Local and HQ).

E.2.1.1 Purpose

The following are overview topics for Contingency Plan consideration and “triggers” that would initiate contingency operations in the event of.

- Screening equipment failure
- Conveyance equipment failure
- Loss of utility power
- Unplanned surges in system demand
- Temporary alternative screening locations for baggage
- Removal of threat “Suspect” bags from the CBRA
- Threat evacuation and associated impact on baggage screening
- Airport Operations emergency Response Plan
- TSA local standard operating procedures
- Horry County Airport Emergency Incident Response Plan

E.2.2 BHS Overview

E.2.2.1 CBIS Overview

The Myrtle Beach International Airport CBIS layout is based on the design standards and practices detailed in the TSA Planning Guidelines and Design Standards (PGDS) Version 3.0, as coordinated between the TSA, AOA and the BNP Design Team. The major objectives of the Integrated CBIS are to improve passenger circulation, eliminate EDS screening from the ticketing lobby to the make-up area, increase baggage handling capacities and improve TSA employee work area ergonomics.

The 14520-3 BHS Specification details the complete system, equipment to be provided and the functional description of operation.

The baggage system consists of a check in area where passengers check baggage, a CBIS area where checked baggage is screened, an outbound make up area where baggage is collected and manually loaded into baggage carts and an inbound area composed of two claim devices with direct loading of the bags and two additional claims that are feed by two inbound transport line.

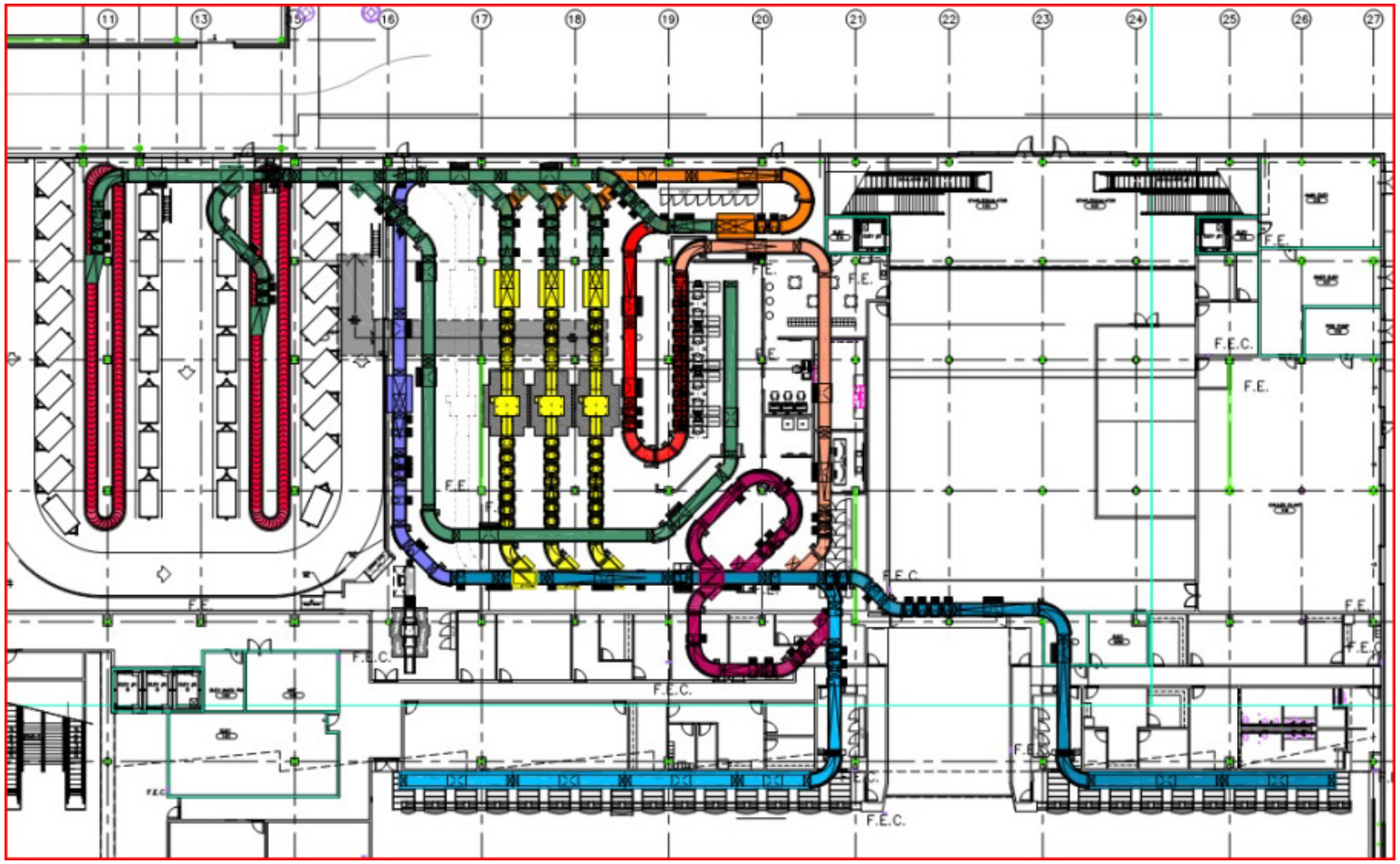
Bags enter the system via one of the two ticket counter lines installed east of grid line D, TC1 is located south of grid line 21 and TC2 is located to the north of Grid line 23. Both ticketing mainlines turn west through and incline up over new ATO offices before turning 90º to the south prior to entering the CBIS area. A new BMA will be installed both the TC1 and TC2 ticketing mainlines to dimension bags and ensure they are within the size characteristics allowed by the L3-6600 EDS device. In gauge bags are diverted off of the TC2, and TC1 mainlines to the SS1, SS2 and SS3 security screening lines. Each SS line has eight (8) queuing positions that feed a L3-6600 EDS device. After bags have been processed by the Level 1 EDS device they are tracked to a Level 1 decision point vertical sorter (SS1-VS, SS2-VS, and SS3-VS) where suspect, lost in tracking, no decision (also pending decision), and EDS error bags are sorted to an associated OSR line. All OSR lines merge together onto the OSR5 mainline and transport all bags to a Level 2 decision point vertical sorter (OSR5-VS). All bags cleared by the EDS device at the Level 1 decision will be diverted by the Level 1 decision point VSU to an associated CL clear bag line. All the CL lines merge together onto the CL5 mainline which routes bags to the make-up sortation area.

If during transport on the OSR line a clear decision is provided for any pending decision bags, a Level 2 VSU will sort those bags to the CL5 Clear Line. All other alarmed (suspect), lost in tracking, or EDS error bags will be diverted by the Level 2 decision point VSU to the AL1 Alarm Line which transports bags to the CBRA for Level 3 inspection or reintroduction into the system via the RI1 line.

All out of gauge bags transition onto the respective OG subsystem (OG1 or OG2) then merge together at a vertical merge onto a single OG3 mainline. These bags merge are routed to the CBRA for Level 3 inspection.

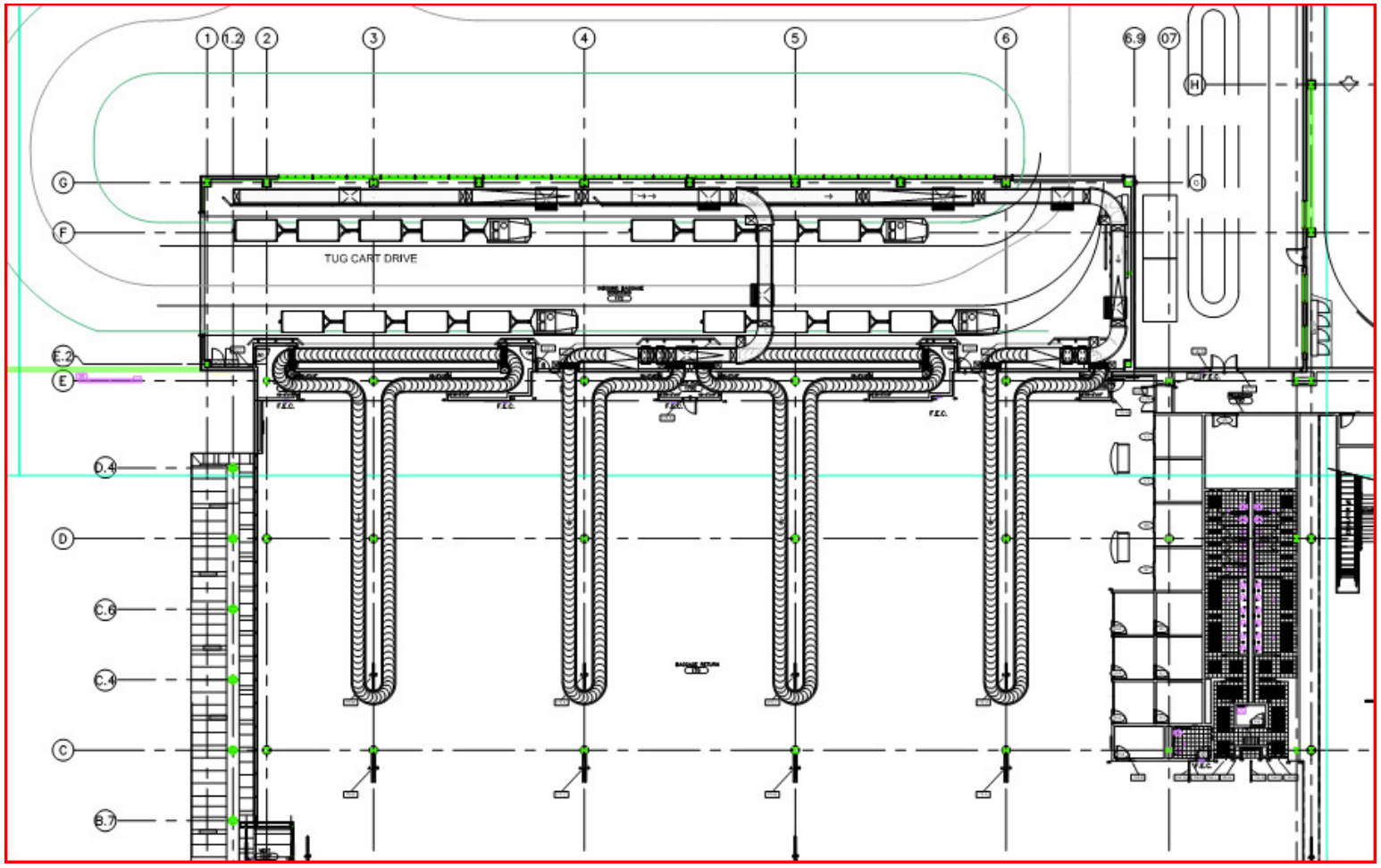
All Level 1 clear bag lines, CL1 through CL3, and the Clear Line from the CBRA, CL6, merge onto the Level 2 Clear Line CL5. CL5 transports bag to the make-up sortation area where all bags are read by an ATR. Once scanned by the ATR CL5 becomes the SL1 mainline. Bags are tracked along the sortation mainline SL1 and are diverted to either the MF1 or MF2 subsystem for transport to the appropriate make-up carousel (MU1 &

MU2). All sortation will be done by the BHS PLC and the SAC (sortation allocation computer) sorting bags by carrier codes. Tip chutes are provided to transition the bags onto the flat plate make-up devices.



The new MYR inbound layout allows all four claim devices to be utilized at once so the inbound operation can handle four inbound flights in process at the same time. Claims CD2 and CD4 utilize a direct drop procedure where the user airlines will unload bags from their carts directly

onto the moving claim device. Claims CD1 and CD3 are both feed by inbound transport conveyors IB1 and IB3 which feed bags onto the claims using tip chutes. The inbound transport load belts are located on the west side of the one-way tug drive aisle and incline up over the tug drive aisle before feeding onto their associated claims.



E.2.2.2 Screening Methodology Overview

The 100% In-Line integrated EDS configuration for this project will consist of three (3) Screening Level classifications which are as follows:

Level 1 – EDS screening:

All originating "in-gauge" checked bags shall be transported into a L3-6600 EDS device for Level 1 screening. Once the bag has been scanned by the L3, the bag is ejected from the L3 scan tunnel. The L3 PLC must then track the bag through the L3 exit tunnel before the bag triggers the first photocell downstream of the EDS device where the EDS machines Level 1 decision is handed back. The BHS PLC then tracks the bag with BHS ID and the EDS decision. If the L3 has assigned the bag a CLEAR decision prior to the Level 1 VSU the BHS will divert the bag up to the associated clear bag line (CL1 through CL3). If the l3 has assigned the bag a SUSPECT decision the bags image will be transferred to an OSR operator for Level 2 processing. These bags as they reach the Level 1 decision point will be diverted down to their respective OSR screening line. Bags that loose tracking or are given and EDS error or unknown status will also be diverted to the OSR screening line.

Level 2 – On Screen Resolution (OSR) operation:

Baggage that receives a SUSPECT decision from the L3 during Level 1 screening will have the suspect image delivered via the NEDS network to a OSR station. The images shall be received and displayed one of multiple monitors in the OSR room. An operator will view the image in the display for a configurable time duration utilizing Threat Resolution Tools (TRT) to determine if the bag can be determined CLEAR or SUSPECT. If the operator determines that the bag is suspect or the allocated time period expires (maximum of 45 seconds), and no decision has been rendered, the image and relevant bag will be given a SUSPECT Level 2 status. These bags shall be diverted at the Level 2 decision point vertical sorter to the AL1 Alarm Line and transported to the CBRA for inspection. Bags that are given a CLEAR decision by an OSR operator will be diverted to the associated Clear Line at the Level 2 decision point vertical sorter.

Level 3 Explosive Trace Detection (ETD) operation:

Lost in tracking bags, EDS Errored or error bags, and valid out of gauge and SUSPECT Level 2 bags will be transported to the CBRA via the Alarm Line for inspections and appropriate handling (ETD). Cleared Level 3 bags will be placed on the CL6 clear bag line that will transport bags across the CBIS area and merge onto the CL5 mainline out to the make-up sortation area.

All Level 3 bags that cannot be cleared with ETD shall be handled per the local EOD protocol. Full access is provided into the CBRA to allow for any required LEO explosive robot to maneuver as required to eliminate/remove the potential threat.

E.2.3 Objectives of the Contingency Plan

E.2.3.1 Contingency Plan Implementation Risk

In the event the CBIS becomes inoperative due to any event which prevents the CBIS from processing baggage in a designed timely manner a contingency plan developed for that event will be implemented.

This plan, dependent on the critical nature and size of event, would require multiple parties to communicate in a timely and efficient manner. If the plan is not implemented properly or promptly, and event that already has degraded the system will only become more compounded and take a longer duration to alleviate.

E.2.3.2 Desired Outcomes

The Desired outcome of implementing a contingency plan is to screen as many bags as possible in the shortest time possible despite an event in the system that would be preventing this operation. A contingency plan would remain in place until the system has reverted to its original state and all the events / faults have been mitigated and corrected.

E.2.3.3 Potential Impacts

If an event that creates a sever long term downtime situation occurs, MYR would be required to quickly and effectively modify their operation to ensure all outbound and transfer baggage are still processed in a timely manner.

E.2.3.4 Recourse Requirements

TSA should have in place a dynamic agent deployment plan to provide any extra staffing inside the CBRA room in the event an unexpected flood of bags is routed to the CBRA. This could be caused by both EDS device faults or in the event the clear bag mainline of the decision point has an extended duration fault.

E.2.4 Contingency Plan – CBIS Failures and Resolutions

The following is a preliminary contingency plan for Myrtle Beach International Airport for the BHS and will be updated by the BHS Contractor based on their functional specification and updated throughout the Construction Phase.

E.2.4.1 General

While expectations for airline ticketing staff, baggage handling staff, TSA personnel and BHS maintenance staff may be different for each event, it may be generalized that additional staff will be required for each discipline. In the case of the BHS maintenance group, there is a set of standard procedures that should be followed for each event. The programmable logic controller (PLC) will incorporate coded control logic to automatically direct the conveyors to produce many of the necessary changes to the system as defined in the following contingency procedures. It should be

noted that for any failure of a system component in the new CBIS or CBRA that is determined to cause an extensive period of downtime or a severe reduction in throughput capacity, the response team can choose to prevent any bags from being routed to the disabled CBIS. Any unscreened or suspect stranded bags in the CBIS will need to be found, unloaded and transported to a CBRA for manually screening. Any clear bags stranded on the clear bag mainline out of the CBIS will need to be recovered and inducted onto a functional input into the sortation system downstream of the CBIS.

E.2.4.2 BHS Contingency Plan

Examples of what may "Trigger" a contingency operation are as follows:

- Screening equipment failure
- Conveyance equipment failure
- Loss of utility power
- Unplanned surges in system demand
- Temporary alternative screening location for baggage
- Removal of threat "Alarmed" bag from CBRA
- Threat evacuation and associated impact on baggage screening
- Airport Operations Emergency Response Plan
- TSA local standard operating procedures
- Standard Operating Procedures (SOP) for transportation security incidents
- Airport Emergency/Incident Response Plan

E.2.4.3 Defining Contingency Operation

The following must be taken into consideration before a full need assessment can be made on the best course of action for any failure:

- Peak or non-peak hours of operation
- Critical nature of failed components
- Difficulty in correcting the failure
- Availability of new components to correct failure

- Availability of appropriate personnel to correct or manage the event
- Time needed to correct the failure

E.2.4.4 Standard Procedures for BHS O&M Staff

- Upon fault recognition dispatch appropriate personnel to faulted conveyor or device for inspection and determination of impact.
- If fault can be rectified in less than 20 minutes, institute fix and then return to normal activities.
- If fault will take greater than 20 minutes to repair, affected operations should be informed and contingency operations implemented.
- Baggage Jam Runners (or Third-party Baggage Handling Agency) will manually transfer stranded bags and load them on closest operational system.
- Maintenance personnel will implement plans to rectify the fault and advise impacted staff of expected time for the conveyor to be operable.
- Once the fault is corrected, maintenance to inform affected staff, through the BHS Control Room, that their operations will return to normal.

E.2.4.5 Standard Procedures for Airline Ticketing Staff

- Determine if failed condition on the affected line requires intervention from BHS Maintenance personnel and inform the BHS Control Room if it does for appropriate action.
- If the rectification is going to take longer than 20 minutes request additional help in moving baggage to a nearby available take away load conveyor (e.g., Baggage Jam Runners or Third-party Baggage Handling Agency).
- Use small carts to facilitate the moving of bags, if redundant conveyor line is far from the Kiosk.
- Carefully place bags on the conveyor and maintain at least 8-inch intervals between bags.

E.2.4.6 EDS Device Failure Notification Procedures

- The EDS vendor should be contacted for the emergency maintenance and repair of TSA provided equipment.
- TSA equipment includes EDS devices, ETD equipment, NEDS interface, on-screen resolution equipment and passive threat resolution information.
- Any changes to the EDS device programming by the TSA must be communicated to the BHS Control Room.
- TSA protocols exist for formal documentation of repairs and maintenance of TSA furnished equipment.
- TSA agents shall clear jams within the EDS device when notified by the BHS Control Room per conformance protocols.

E.2.4.7 PLC Failure

A PLC failure may affect a large area resulting in loss of control for many conveyors or even the complete matrix or both. PLC failures are typically rare and relatively easy to fix and recover from.

The PLC control system has been compartmentalized into 4 distinct areas:

- CBIS
- Upstream of the CBIS
- Downstream of the CBIS
- Inbound

Each master PLC located in the control room maintains a redundant hot back up clone that automatically switch (seamless operation) between the two when one fails.

The Inbound system is provided with cold back up PLC's that can be manually switched between the two when one fails.

It should be noted that maintenance procedures must be instituted and maintained that ensure the integrity of the backup system. All program changes made to a PLC must also be made to its back up PLC.

E.2.4.8 Computer Failure

The computer system servers—those used for sort control, reporting and fault monitoring—are all protected with redundant backup servers. These redundant servers are called hot backups in that they are constantly observing the activities of their counterpart online server and they can completely take over the activities of the online server if necessary without any intervention from an operator.

PLC sort control is an additional sort backup.

E.2.4.9 Ticket Counter Load Belts Failure Prior Fire Doors (TC1, TC2)

If the loading take-away belt for ticket counters conveyors become inoperable a conveyor immediately downstream of the faulted conveyor and before the security door may be used.

E.2.4.9.1 Procedures for Airline Ticketing Staff

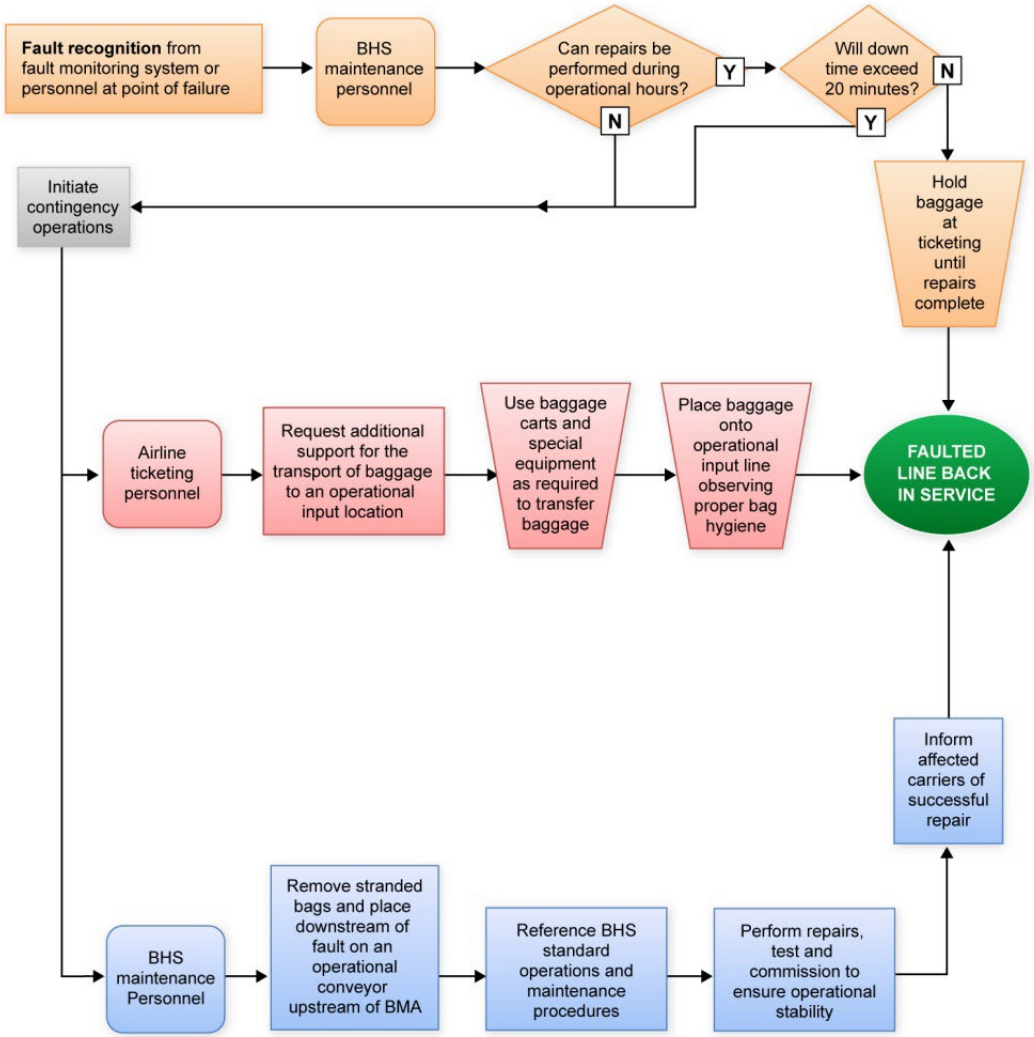
- Request additional help for moving bags to next available load point.

- If necessary, especially during peak loading periods, use small cart to facilitate transfer of bags.
- Carefully place bags lengthwise onto the conveyor observer proper bag hygiene.

E.2.4.9.2 Procedures for BHS Maintenance Staff

- Assess fault and time necessary to correct. If more than 20 minutes is needed initiate contingency operations.
- Determine if work can be conducted during airport operational hours as this work involves the public areas.
- If only one ticket counter can be used provide added personnel as required to transport baggage to the operational load belt.
- Follow BHS maintenance standard procedures.
- Coordinate with all parties involved to complete work in a timely and least disruptive manner.

TICKETING OR CURBSIDE FAILURE



E.2.4.10 Ticket Counter Failure (TC1, TC2) Downstream of Fire Door

This will be treated similar to line failure before the fire doors. Baggage already placed onto these conveyors will need to be removed and placed on the nearest downstream, operating conveyor before the BMA on either transport line.

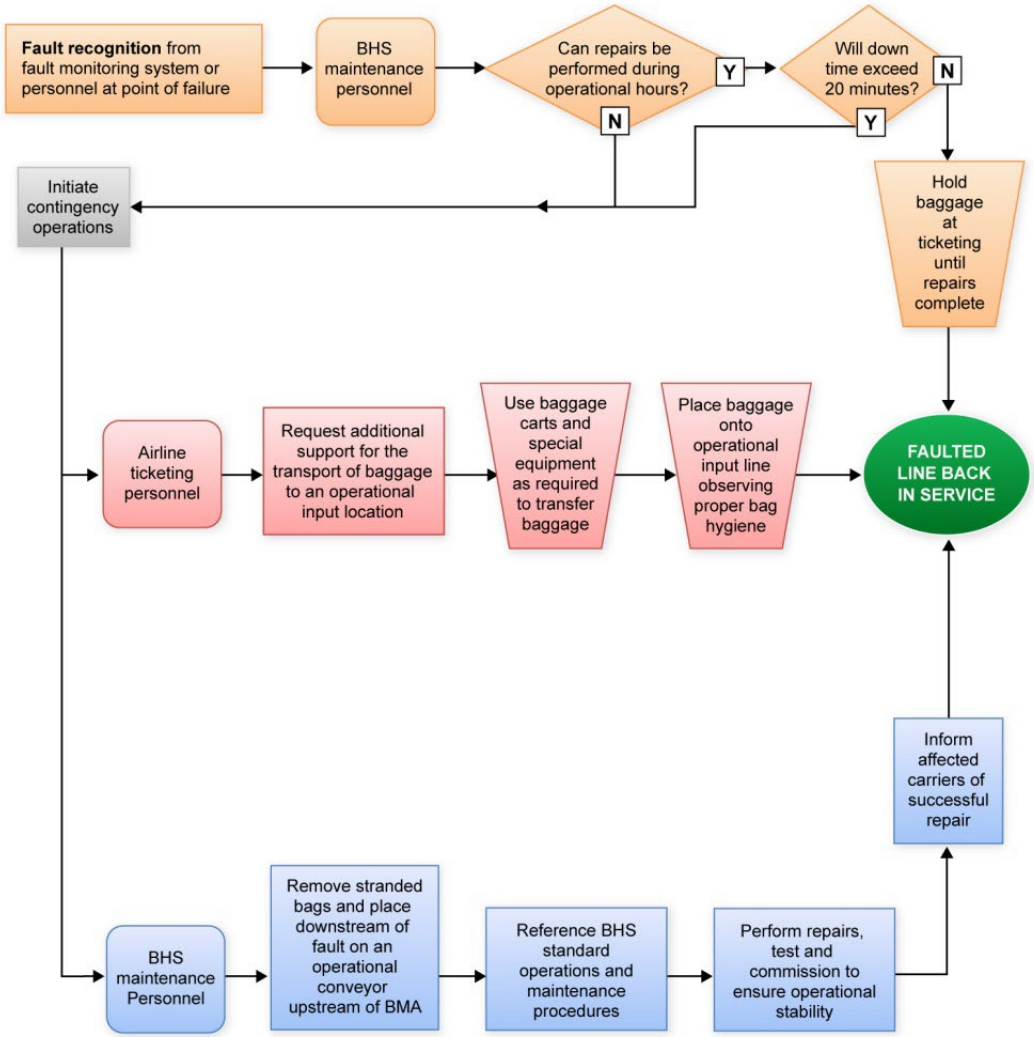
E.2.4.10.1 Procedures for Airline Ticketing Staff

- Request additional help for moving bags to the other ticket counter load belts.
- If necessary, especially during peak loading periods, use small cart to facilitate transfer of bags.
- Carefully place bags lengthwise onto the conveyor in intervals at least eight inches apart.

E.2.4.10.2 Procedures for BHS Maintenance Staff

- Assess fault and time necessary to correct; if more than 20 minutes is needed initiate the contingency operations.
- Remove bags stranded on inoperable conveyors and place them before the BMA on operational downstream conveyors or on the other ticket counter transport line.
    - Follow BHS maintenance standard procedures.

TICKETING OR CURBSIDE FAILURE



E.2.4.11 Main Transport Line (TC1 and TC2) Failure

These two transport lines convey baggage from the ticket counter to the two EDS matrices. The lines together provide a redundant feature and increased load potential for the expected demand on the system. If one of the lines becomes inoperable carriers using the ticket counter will need to use the input points for the other ticket counter. This is obviously an undesirable condition that may provide some relief but during peak periods will require significant coordination between the carriers. It is a high priority that needs to be corrected very quickly.

E.2.4.11.1 Procedures for Airline Ticketing Staff

- Request additional help for ticket agents in moving baggage.
- Use small cart to facilitate transfer of bags to the most convenient working conveyor.
- Carefully place bags lengthwise onto the conveyor in intervals at least eight inches apart.
- Select baggage for flights with departure time greater than one hour for placement later into the system.

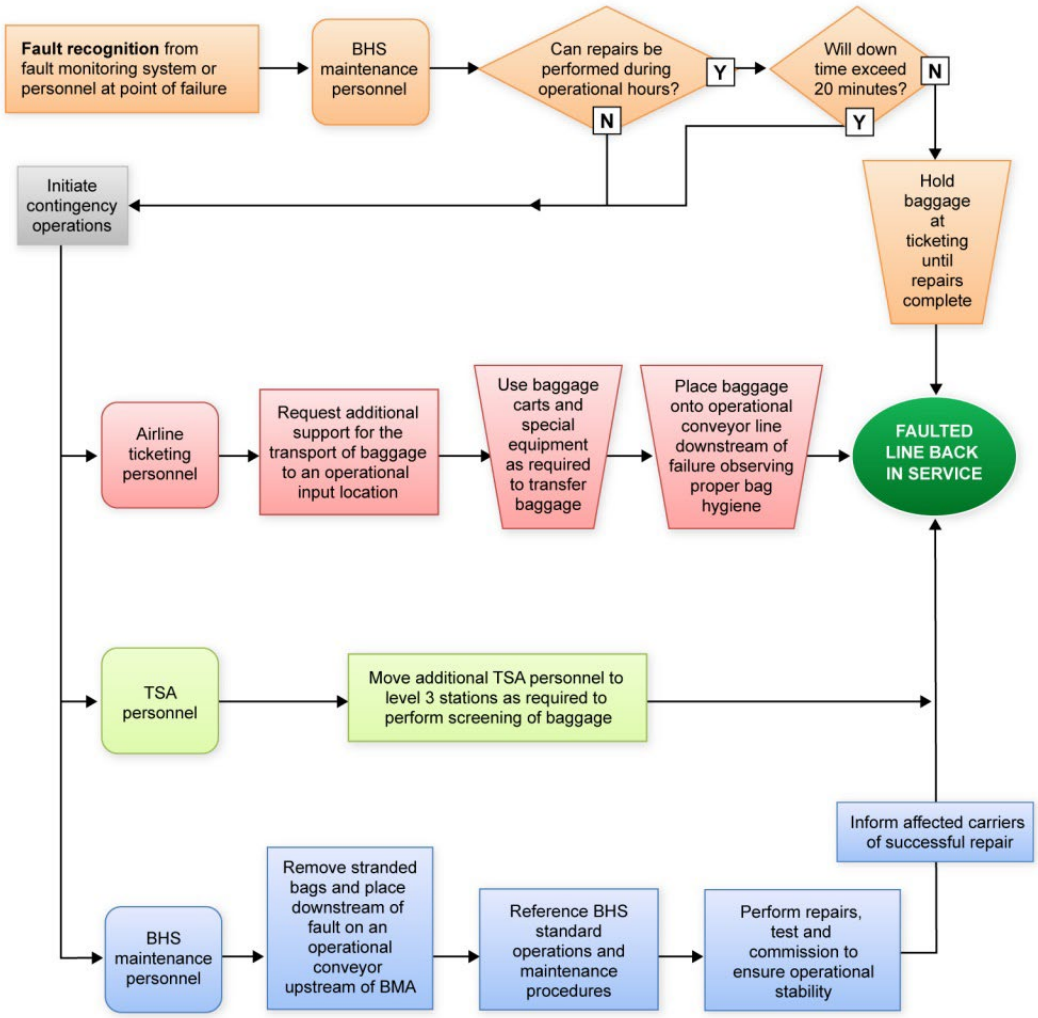
E.2.4.11.2 Procedures for TSA Staff

- Additional personnel in the CBRA may be required for a short period of time for possible jams at the entrance of EDS devices or UNK status bags from the stranded bags placed back in the BHS.
- During peak hours additional staff may be needed due to potential increase in no decision, suspect, incomplete images or jams in the EDS machines if only one matrix will be used.

E.2.4.11.3 Procedures for BHS Maintenance Staff

- Assess fault and time necessary to correct and if more than 20 minutes is needed initiate contingency operations.
- Manually remove bags left stranded on any of the failed conveyors and load on the nearest and accessible operating conveyor. Bags can be placed on the ED lines that feed the EDS devices with additional consideration for OOG jams at the entrance of EDS device.
- Ensure the crossover diverter on the faulted line is in “Divert All” mode.
- Follow BHS maintenance standard procedures.
- Coordinate with all parties involved to complete work in a timely and least disruptive manner.

MAIN TRANSPORT LINE FAILURE



E.2.4.12 Baggage Measuring Array Failure (TC2-BMA)

If the baggage measuring array fails, bags cannot be sized appropriately for the EDS machine. The automatic control of the BHS will recognize the fault and place the OOG diverter into "Divert all" mode. Bags will be transferred via high speed diverter to the OOG line for reinsertion of "in-gauge" baggage and Level 3 screening of all OOG bags.

In the event that the baggage measuring array fails, bags shall continue to divert to the EDS shunts. In the event that conveying or screening equipment failures occur down-line of the OOG diverter, the OOG diverter may be manually set to operate in a "limited operation" mode in which all baggage is conveyed directly to the CBRA for manual screening. Engaging the "limited operation" mode shall only occur with concurrence from local TSA.

E.2.4.12.1 Procedures for Airline Ticketing Staff

- Ticket counter agents should take extra care to ensure Out-of-Gauge bags are not placed into the system. Ensure that only bags that will pass through the EDS machines are placed on the ticket counter lines.
- Move Personnel to the CBRA to assist TSA with increased demand as a result of excess bags with UNK status arriving in the CBRA.
- Use small cart to facilitate transfer of OOG bags to CBRA for Level 3 screening.

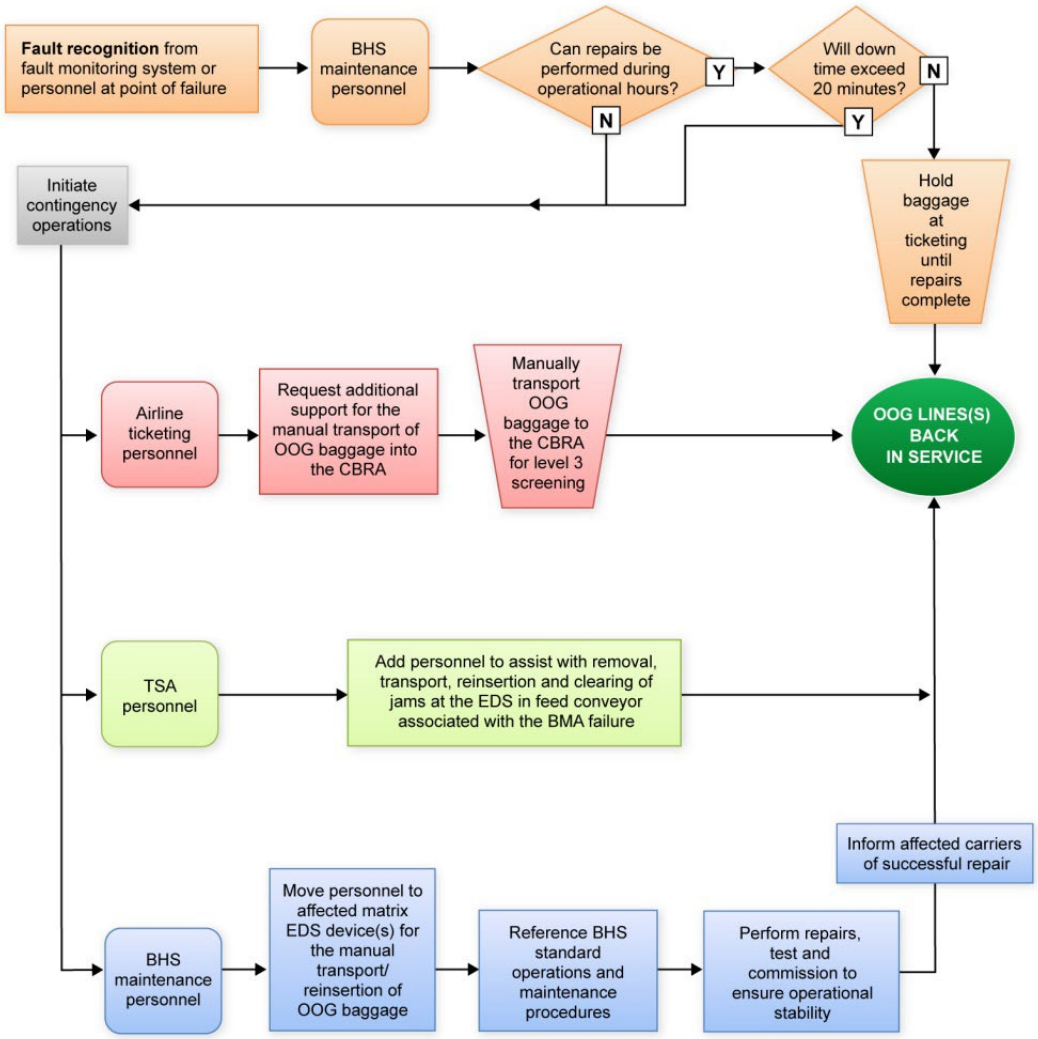
E.2.4.12.2 Procedure for TSA Staff

- Add staff for increased demand in CBRA to assist with the reinsertion or search of bags with incomplete images during peak hours.
- Add staff to assist with jams at the EDS devices in feed conveyors.

E.2.4.12.3 Procedures for BHS Maintenance Staff

- Assess fault and time necessary to correct; if longer than 20 minutes is needed initiate the contingency operations.
- Ensure that the crossover high speed diverter on the subsystem OG1 is placed into Divert all mode if bag screening demand is low.
- Upon direction from TSA place the OG1 conveyor into "divert none" mode. Simultaneously place the SS1 thru SS3 HSPD's into "divert all" mode.
- Provide additional staff to Monitor and assist the TSA in clearing jams at the in feed conveyor of the EDS devices.
- Follow BHS maintenance standard procedures
- Complete work quickly as this fault condition seriously damages the ability to use the automated features of the matrix.

BMA FAILURE


Fault recognition from fault monitoring system or personnel at point of failure
BHS maintenance personnel
Can repairs be performed during operational hours?
Y
N
Will down time exceed 20 minutes?
N
Y
Initiate contingency operations
Hold baggage at ticketing until repairs complete
Airline ticketing personnel
Request additional support for the manual transport of OOG baggage into the CBRA
Manually transport OOG baggage to the CBRA for level 3 screening
OOG LINES(S) BACK IN SERVICE
TSA personnel
Add personnel to assist with removal, transport, reinsertion and clearing of jams at the EDS in feed conveyor associated with the BMA failure
Inform affected carriers of successful repair
BHS maintenance personnel
Move personnel to affected matrix EDS device(s) for the manual transport/ reinsertion of OOG baggage
Reference BHS standard operations and maintenance procedures
Perform repairs, test and commission to ensure operational stability

E.2.4.13 Out of Gauge Line Failure (OG1)

The system's monitoring software will recognize the fault condition. BHS personnel will inform the Airlines ticketing staff of the failure and the expected duration of the fault.

E.2.4.13.1 Procedure for Airline Baggage Handling Staff

- Add baggage handling staff to the location of fault to manually remove bags and load back downstream on the first operational conveyor to be transported to CBRA.
- Ticket counter agents should take extra care to ensure Out-of-Gauge bags are not placed into the system. Ensure that only bags that will pass through the EDS machines are placed on the ticket counter lines.
- Use small cart to facilitate transfer of OOG bags to CBRA for Level 3 screening.

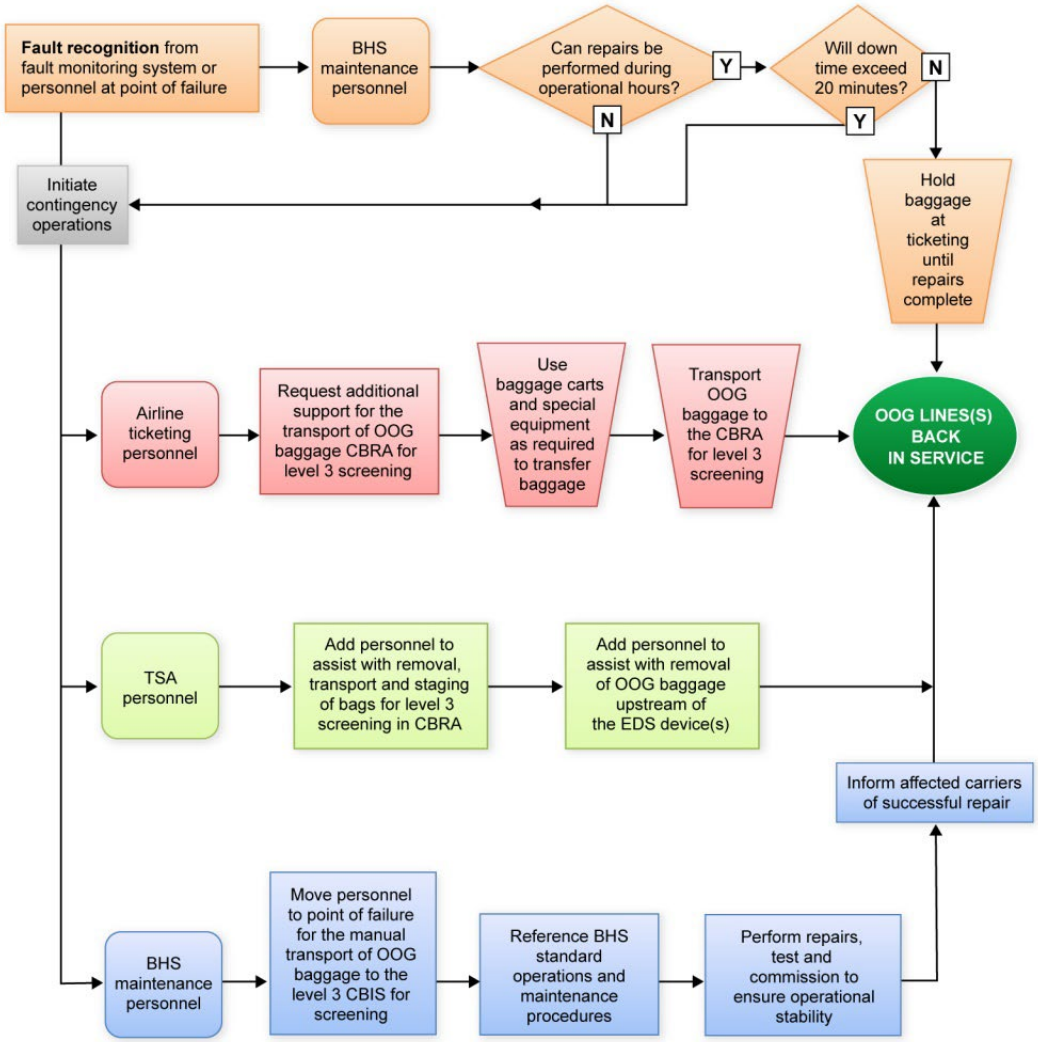
E.2.4.13.2 Procedure for TSA Staff

- Add staff for increased demand in CBRA to assist with the reinsertion or search of bags with incomplete images during peak hours.
- Add staff to assist with jams at the EDS devices in feed conveyors.

E.2.4.13.3 Procedures for BHS Maintenance Staff

- Asses fault and time necessary to correct and if more than 20 minutes is needed initiate contingency operations.
- Determine if the work to repair the fault is more disruptive than the condition itself and if a suitable temporary fix can accommodate TSA until the end of working day, then work should be conducted during close-of-business hours. All parties should agree upon this solution, otherwise repair efforts should be conducted in the earnest.
- Manually transport baggage to CBRA for Level 3 screening.
- Follow BHS maintenance standard procedures.
- Coordinate with all parties involved to complete work in a timely and least disruptive manner.

OUT OF GAUGE LINE FAILURE



E.2.4.14 EDS Machine, EDS-HSD, EDS Lines Failure or Matrix Failure Upstream of Level One Decision Point

If one of the EDS machines becomes inoperable, the diverter or the conveyor line directly feeding the machine fails; the other operable machines will be responsible for all security scanning. This is accomplished automatically by monitoring software that shuts down the diverter feeding that line. This is also true regarding failures occurring on any of the security shunts lines.

In the event that the two lines on the matrix become unavailable, bags already in the system on the affected subsystems will manually be removed and transported to the CBRA for screening. The stranded bags on the security shunt lines will be manually removed and placed on the working matrix before the EDS machines. The system's monitoring software will recognize the fault and place the HSD on the faulted subsystem in "Divert none" mode. In case that the operational security shunt lines become full the bags will continue to CBRA via the OG line.

E.2.4.14.1 Procedure for Airline Baggage Handling Staff

- Monitor the system for potential die back.
- Add staff to the CBRA to assist in taking bags to the ETD station or an area secured for build-up of the bags.

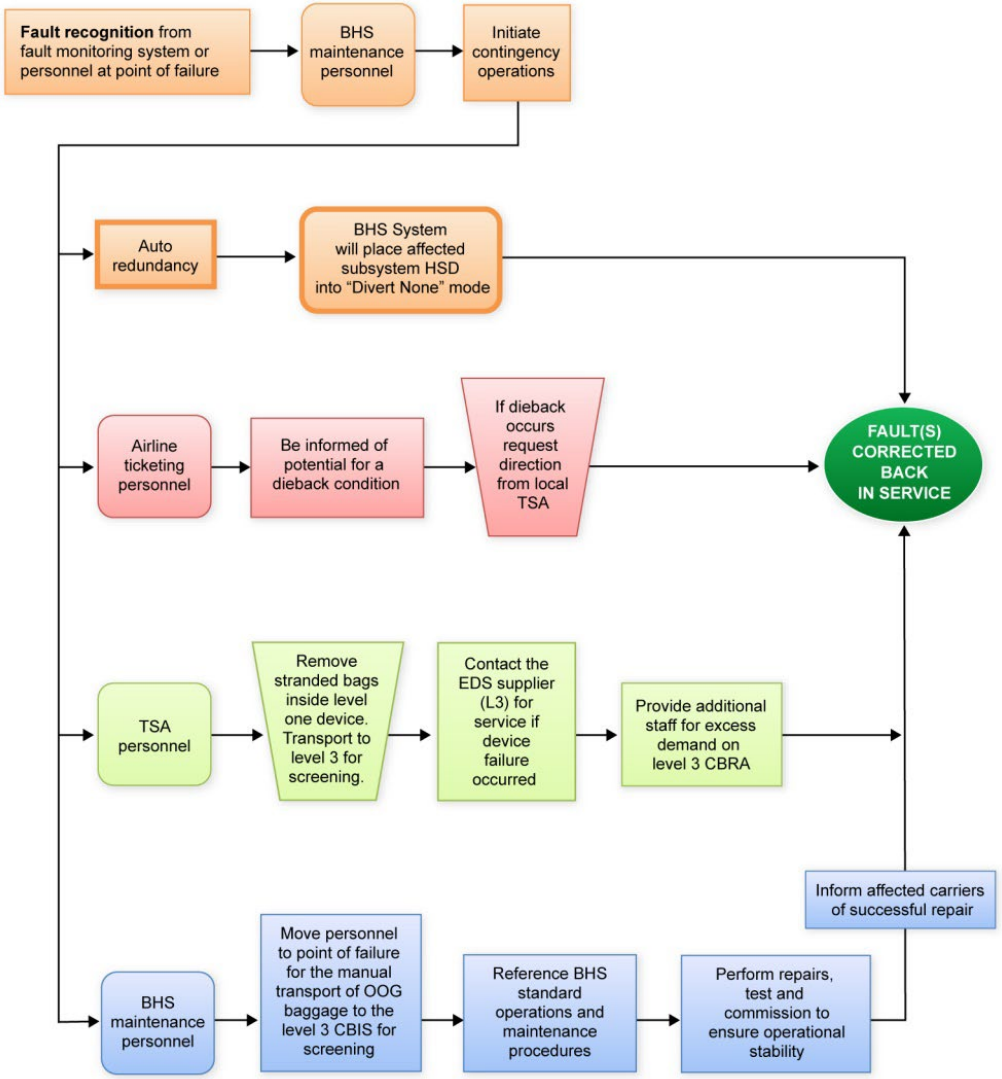
E.2.4.14.2 Procedure for TSA Staff

- Manually remove any bag stranded in the EDS device and place them on alternate operational EDS line upstream of EDS device.
- In case multiple SS lines are faulted add staff in the CBRA to assist in the screening of excess baggage.
- Contact appropriate EDS service vendor if the EDS machine malfunctions and needs maintenance.

E.2.4.14.3 Procedures for BHS Maintenance Staff

- Follow BHS maintenance standard procedures.
- Ensure that HSD for the failed line is bypassed and placed back into use once the fault is corrected.
- Remove bags stranded on the failed feeding line to the EDS machines and manually place them on the other operable EDS line upstream of EDS device.
- Carefully monitor the system to ensure that baggage system does not back up and cause cascading shutdowns of the system.

EDS DEVICE, EDS HSD, SS LINE OR MATRIX FAILURE



E.2.4.15 First Decision Point Vertical Sorter Failure (SS1-VS through SS3-VS)

This will be treated much the same as for the failed security shunt lines or EDS machine. Crossover lines can be used for load balancing.

E.2.4.15.1 Procedure for Airline Baggage Handling Staff

- Monitor the system for potential die back.
- Add staff to the CBRA to assist in taking bags to the ETD station or an area secured for build-up of the bags.

E.2.4.15.2 Procedure for TSA Staff

- Manually remove any bag stranded in the EDS device and no decision bags after the EDS machine and place them onto working EDS lines before the EDS machines.
- Contact appropriate EDS service vendor if the EDS machine malfunctions and needs maintenance.

E.2.4.15.3 Procedures for BHS Maintenance Staff

- Follow BHS maintenance standard procedures.
- Ensure that HSD for the failed line is bypassed and placed back into use once the fault is corrected.
- Remove bags stranded on the failed feeding line to the EDS machines and manually place them on the other operable EDS line.
- Carefully monitor the system to ensure that baggage system does not back up and cause cascading shutdowns of the system.

E.2.4.16 EDS Clear Line Failure (CL1, CL2, CL3) Prior to CL5

EDS cleared bag lines face the same considerations as EDS machines and security shunt lines failure. The monitoring software should recognize the fault and the other operable machines will be responsible for security screening. This is accomplished automatically and the respective line will be shut down by placing the diverter in divert all. The line will not be used while the condition is in effect, alternative shunt lines will be used instead and load balancing use of the crossover lines will be employed.

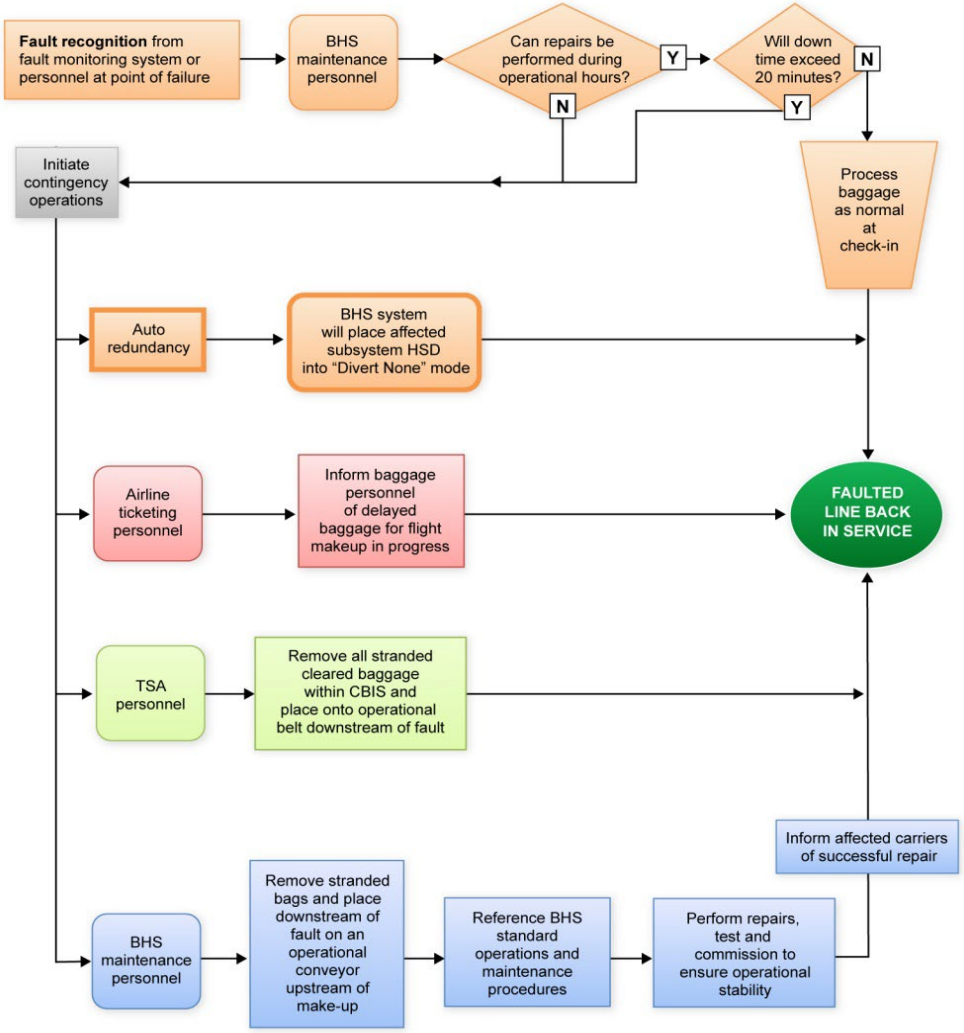
E.2.4.16.1 Procedure for Airline Baggage Handling Staff

- Manually remove any cleared bags on the faulted conveyors and place them on first downstream operational conveyor on Clear Line or sortation transport line.
- Request additional staff for transport of cleared bags on operational conveyor on alternate Clear Line or sortation line.

E.2.4.16.2 Procedures for BHS Maintenance Staff

- Follow BHS maintenance standard procedures.
- Ensure that HSD for the failed line is bypassed and placed back into use once the fault is corrected.
- Assist in moving cleared bags downstream of the fault on operational conveyor on alternate Clear Line or sortation line.
- Carefully monitor the system to ensure that baggage system does not back up and cause cascading shutdowns of the system.

CLEAR LINE FAILURE UPSTREAM OF MERGE



E.2.4.17 OSR Decision Line Failure (OSR1, OSR2, OSR3, OSR5)

Alarm Lines failure face the same considerations as EDS machines and security shunt lines failure. The monitoring software should recognize the fault and the other operable machines will be responsible for security screening. This is accomplished automatically and the respective line will be shut down by placing the diverter in divert all. The line will not be used while the condition is in effect and alternative shunt lines will be used instead and load balancing use of the crossover lines will be employed.

Only the OSR5 line downstream of the OSR line merges create a complete shut down in the event of a failure.

E.2.4.17.1 Procedure for Airline Baggage Handling Staff

- Add staff to the CBRA to assist in taking bags to the ETD station or an area secured for build-up of the bags.

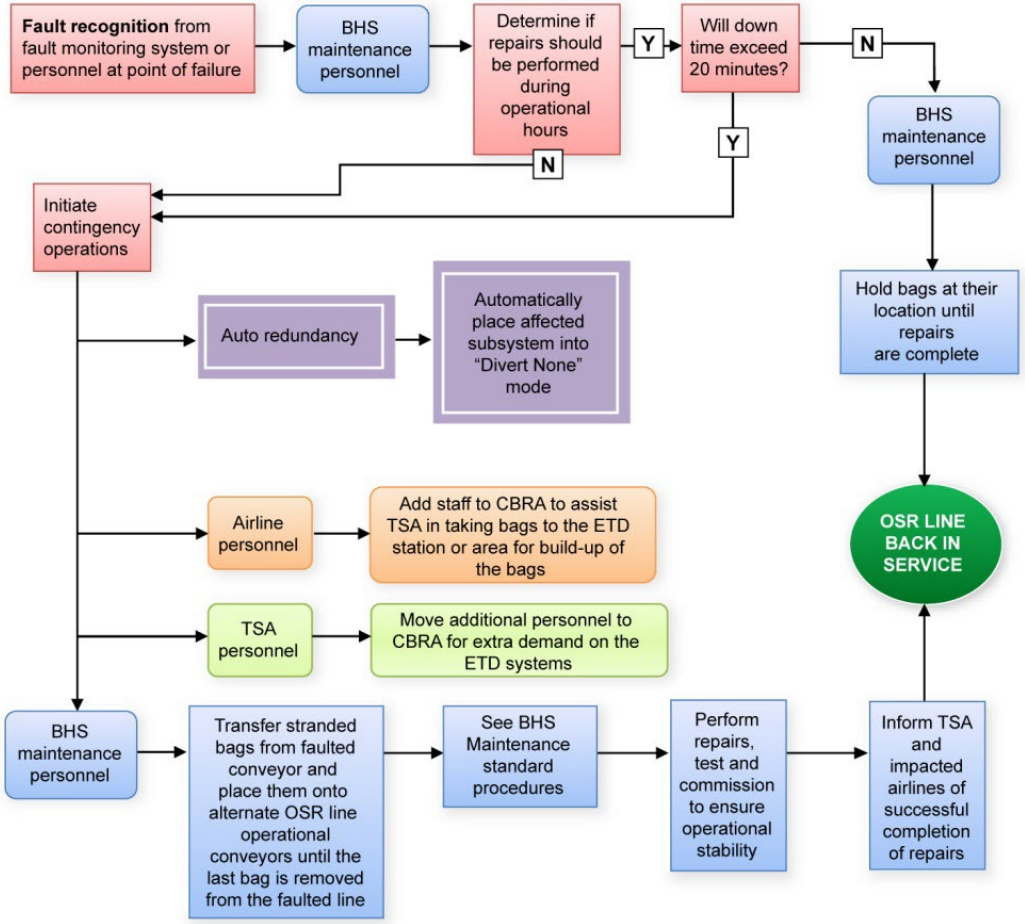
E.2.4.17.2 Procedure for TSA Staff

- Move additional personnel to the CBRA for the extra demand on the ETD systems.

E.2.4.17.3 Procedures for BHS Maintenance Staff

- Follow BHS maintenance standard procedures.
- Ensure that HSD for the failed line is bypassed and placed back into use once the fault is corrected.
- Remove bags stranded on the failed line and place them downstream on the most accessible conveyor that transports bags to CBRA or carry to CBRA until the last bag is removed from the faulted line.
- Carefully monitor the system to ensure that baggage system does not back up and cause cascading shutdowns of the system. Use load balancing techniques with the crossover lines if necessary.

OSR DECISION LINE FAILURE PRIOR OF MERGING ONTO OSR5



E.2.4.18 Main OSR Decision Line Failure (OSR5)

E.2.4.18.1 Procedure for Airline Baggage Handling Staff

- Move additional personnel to the CBIS/CBRA for unloading bags from the Alarm Line and taking them to the ETD stations.
- Assist O & M and TSA to reposition bags from the failed conveyor to the most accessible functional conveyor downstream of the failed conveyor. These bags would enter the CBRA with an UNK status.
- Place excess bags in an area secured for build-up of the bags.

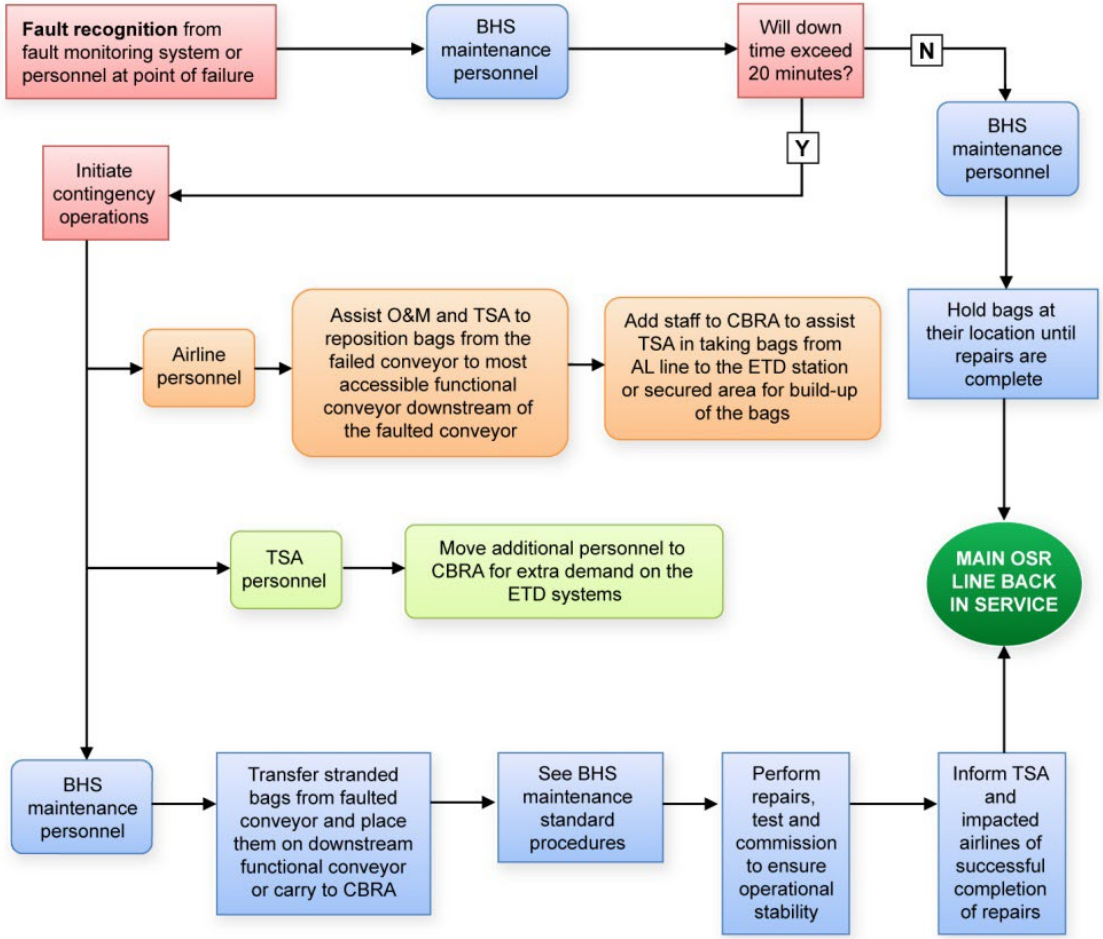
E.2.4.18.2 Procedure for TSA Staff

- Move additional personnel to the CBRA for the extra demand on the ETD systems.

E.2.4.18.3 Procedures for BHS Maintenance Staff

- All bags stranded on the inoperable line should be removed and placed in the CBRA.
- Place excess bags in an area secured for build-up of the bags.
- Follow BHS maintenance standard procedures.
- The faulted conveyor should be repaired quickly.

MAIN OSR DECISION LINE FAILURE (OSR5)



E.2.4.19 Second Decision Point Failure (OSR5-VS)

If the OSR5 vertical sorter fails then all baggage not cleared and with an associated image from an EDS machine will continue to the CBRA for resolution if the sorter can be locked in the alarm position. This is a temporary fix until BHS maintenance is prepared to fix the sorter that can be accomplished during the airport's non-operational hours. Bags cleared at Level 2 will be conveyed to the CBRA where they can be transferred to CL6 line. TSA will need to provide extra staffing in the CBRA until the sorter is fixed. If the sorter cannot be used, then BHS maintenance or baggage handling personnel will need to remove bags from the line prior to the sorter and place bags back on the Alarm Line after the sorter. Tracking will be lost and all related images will not be associated with the bags. A dedicated area will be used for the collection of bags awaiting resolution.

E.2.4.19.1 Procedure for Airline Baggage Handling Staff

- Move additional personnel to the CBRA to assist TSA personnel in unloading excess bags from the AL1 Alarm Line and taking them to an area secured for build-up of the bags.
- Help BHS maintenance staff remove stranded bags from the OSR5 line and place them back onto downstream functional AL1 conveyor.

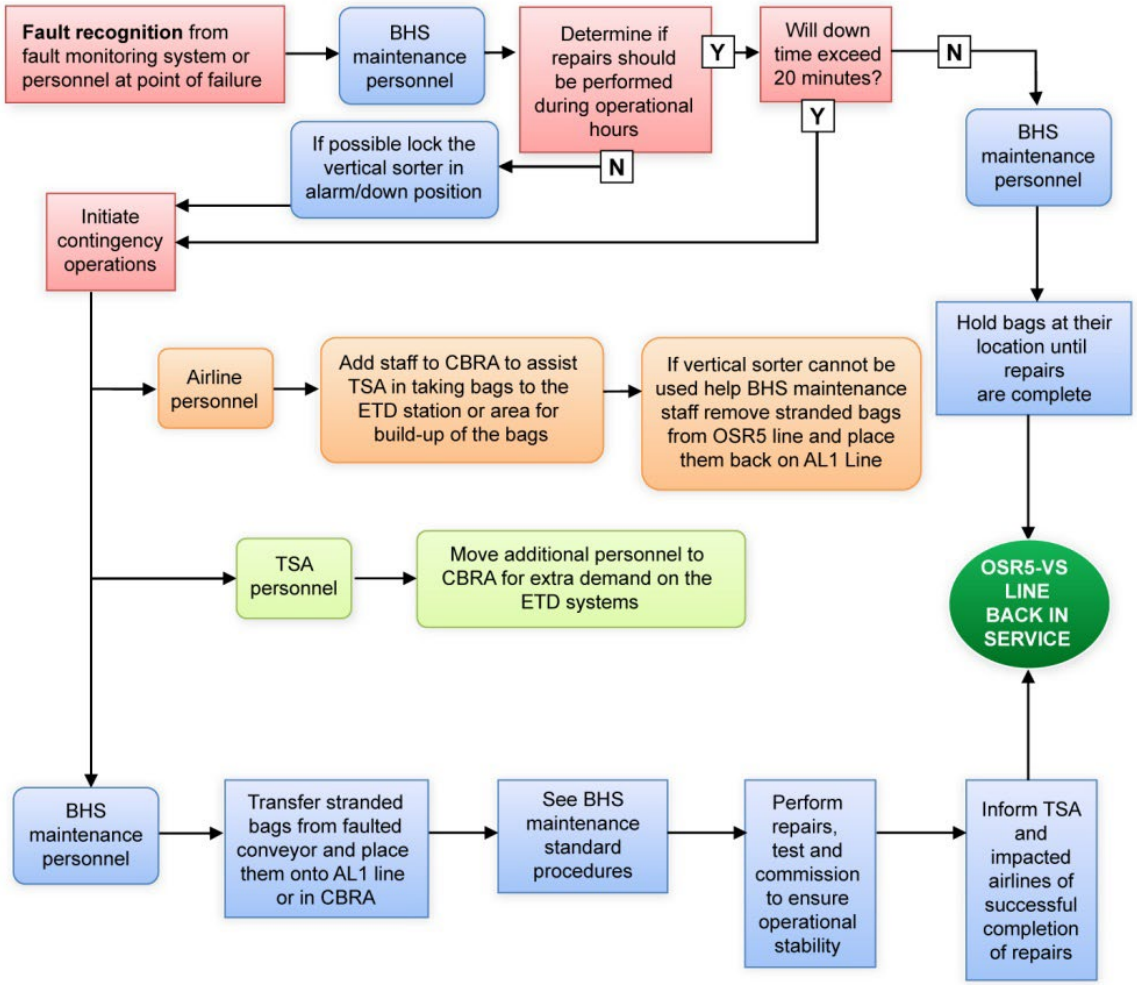
E.2.4.19.2 Procedure for TSA Staff

- Move additional personnel to the CBRA for the extra demand on the ETD systems.

E.2.4.19.3 Procedures for BHS Maintenance Staff

- If possible and desirable place the vertical sorter in manual mode and lock in the divert-to-alarm-line placement. Perform the repair at a more convenient time.
- If not, the failed vertical sorter should be placed out of service and quickly repaired. It will be placed back into service once the fault is corrected.
- All bags stranded on the inoperable line should be removed and placed in the CBRA or on the Alarm Line downstream of the failed vertical sorter.
- Follow BHS maintenance standard procedures.

SECOND DECISION POINT FAILURE OSR5-VS



E.2.4.20 CBRA Clear Line Failure (CL6)

The system is designed with one cleared bag line originating in the CBRA.

E.2.4.20.1 Procedure for Airline Baggage Handling Staff

- Move personnel and baggage tub carts to the CBRA to assist TSA staff in moving cleared bags to CL5 line after the level 2 vertical sorter unit (OSR5-VS).

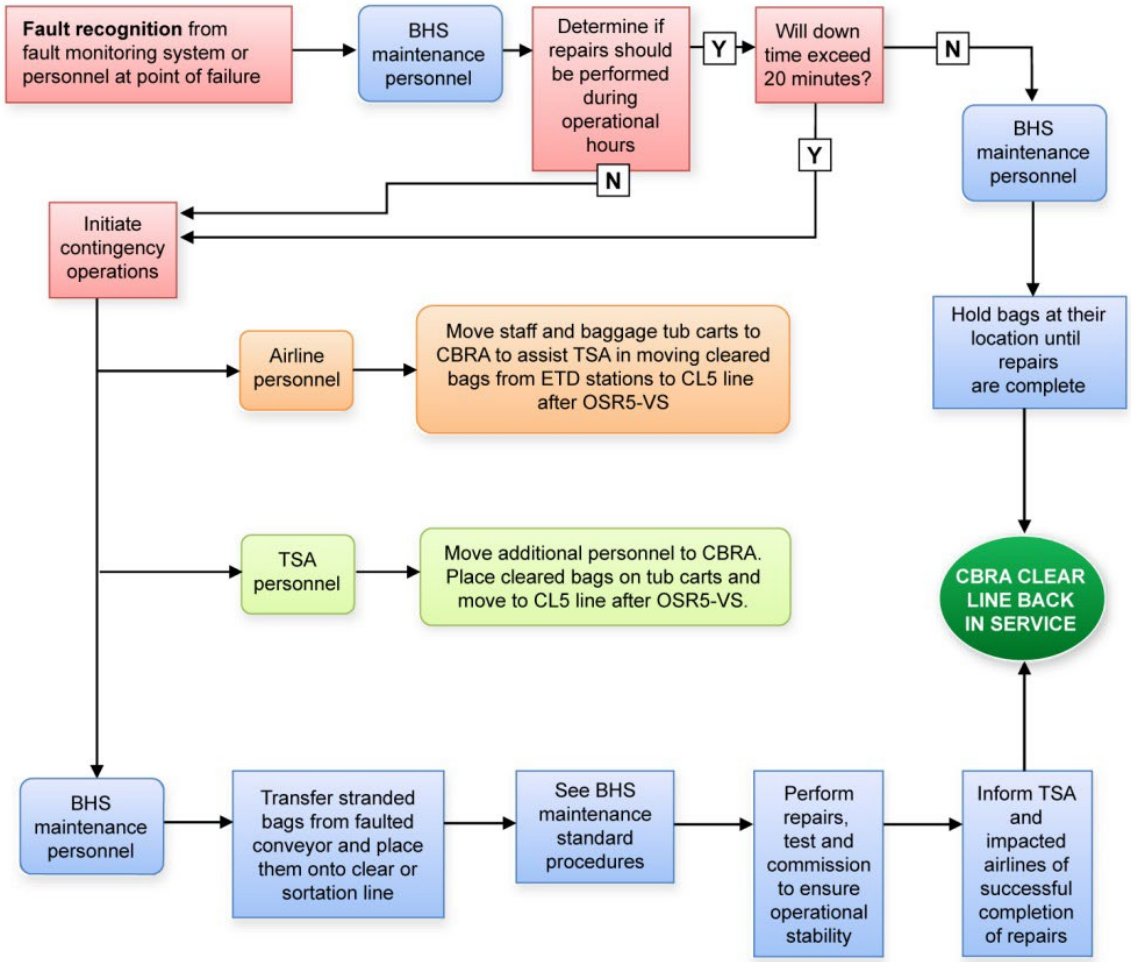
E.2.4.20.2 Procedure for TSA Staff

- Place cleared bags in the CBRA on tub carts and move them to an accessible location on CL5 line after the OSR5-VS.

E.2.4.20.3 Procedures for BHS Maintenance Staff

- Manually remove all stranded cleared bags from the line with the faulted conveyor and place them back on operational belts on clear or sortation line downstream of the fault or take them to CBRA.
- Follow BHS maintenance standard procedures.

CBRA CLEAR LINE FAILURE (CL6)



E.2.4.21 OSR Failure

If the ability to use the OSR services fails then all baggage will continue to the CBRA for resolution.

E.2.4.21.1 Procedure for TSA Staff

- Move additional personnel to the CBRA.
- Implement procedures for securing service from the EDS/OSR vendor.

E.2.4.22 Alarm Line Failure (AL1) Post OSR Decision

If an AL1 conveyor fails after the last decision point, bags will be manually removed and taken to the ETD stations for resolution. Tracking will be lost and related images will not be associated with the bags.

E.2.4.22.1 Procedure for TSA Staff

- Move additional personnel to the CBRA.

E.2.4.22.2 Procedures for BHS Maintenance Staff

- All bags stranded on the inoperable portion of the line should be removed and placed on an operable AL1 conveyor downstream of the failed conveyor or in the CBRA.

E.2.4.23 Reinsertion Line Failure (RI1)

If RI1 line fails bags will be removed from the last operational conveyor and placed back on the same line downstream of the fault or on either TC subsystem upstream of the BMA. Quickly correct the fault as this affects the operations in CBRA.

E.2.4.23.1 Procedure for Airline Baggage Handling Staff

- Move personnel and baggage tub carts to the CBRA to assist TSA staff in moving bags from RI faulted conveyor to the next downstream operational conveyor.

E.2.4.23.2 Procedure for TSA Staff

- Move additional personnel to the CBRA to move bags from the faulted RI conveyor to a working RI conveyor.

E.2.4.23.3 Procedures for BHS Maintenance Staff

- Asses fault and time necessary to correct and if more than 20 minutes needed initiate contingency operations.
- All bags stranded on the inoperable portion of the line should be removed and placed on an operable RI1 conveyor downstream of the failed conveyor or on either TC line before the BMA.
- Follow BHS maintenance standard procedures.
- Quickly correct point of failure.

E.2.4.24 Cleared Bag Line Failure (CL5) Post Second Decision Point Failure

If a conveyor fails on the CL5 cleared bag line after the OSR decision point then the bags will need to be manually removed from the line and placed back on it downstream of the failed conveyor. If the line is inoperable for an extended period of time then the Alarm Line AL1 may be used instead and all OSR cleared bags (if faulted conveyor is upstream of the CL5 conveyor that is the take away for CL1 and CL2) will travel to the CBRA where they will be noted as cleared and placed on the CL6 line that merges onto sortation line (SL1).

If the take away conveyor on the CL5 line for CL1 and CL2 lines fails then crossover diverter will be placed in “Divert All”, stranded bags cleared at level 1 on EDS Clear Line (CL1 and CL2) will be removed and placed on operational downstream Clear Line or sortation line and SS1-VS, SS2-VS and OSR5-VS will be placed in sort-to-Alarm Line (down position) to travel all bags remained in these subsystems regardless of status to CBRA where the clear bags will be noted as cleared and placed on the CL6 line (that merges onto sortation line SL1).

If the take away conveyor on CL5 line for CL3 conveyor fails then the only alternative for all cleared bags to exit the system is via CL6 thus all bags will be directed (all VSU’s will be placed in sort-to-Alarm Line, down position) to CBRA where clear bags will be noted as cleared and placed on the CL6 line (that merges onto sortation line SL1).

E.2.4.24.1 Procedure for Airline Baggage Handling Staff

- Move additional personnel to the affected conveyors to assist BHS maintenance personnel in unloading bags from the CL5 line upstream to the fault and placing them back on the line downstream of the fault.
- If bags remain on the Alarm Line and enter the CBRA then baggage handling personnel will need to assist TSA personnel in loading clear bags onto the CL6 line.

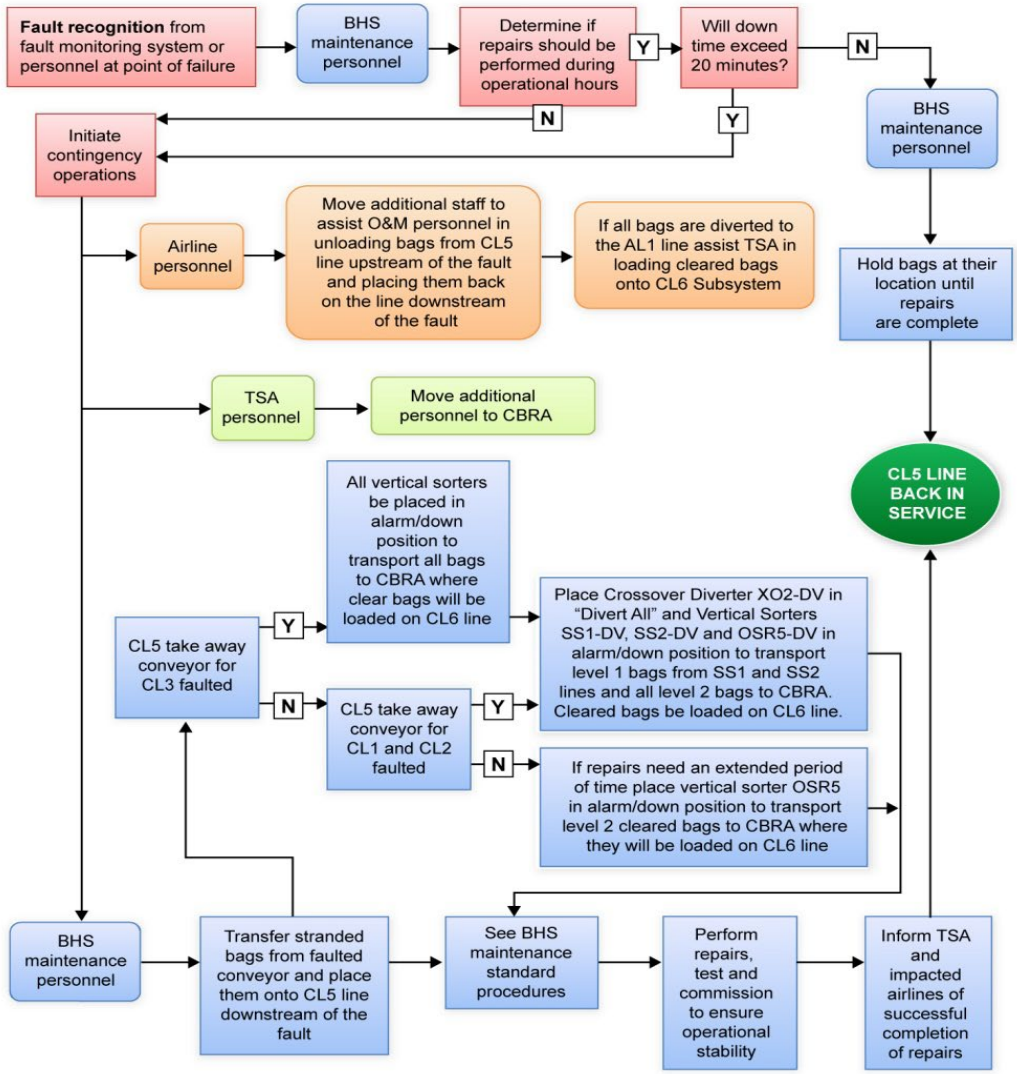
E.2.4.24.2 Procedure for TSA Staff

- Move additional personnel to the CBRA.

E.2.4.24.3 Procedures for BHS Maintenance Staff

- All bags stranded on the inoperable portion of the line should be removed and placed on an operable CL5 conveyor downstream of the failed conveyor.
- If line is inoperable for an extended period of time then place OSR vertical sorters in a locked position with all bags staying on the AL1 Alarm Line.

CLEAR LINE POST SECOND DECISION POINT FAILURE CL5



E.2.4.25 Sortation Line Failure (SL1)

The Main Terminal sort area does not include redundant transport lines. This reduces some of the contingency possibilities when line and component failures occur. However sortation line starting and continuing very close to where the make up units are located bags can be unloaded from the faulted conveyor and either manually sorted and loaded into tugs if the faulted conveyor is before the make up feed line 1 diverter (MF1-DV) or placed back on the line, downstream of the fault, feeding the default make up 2.

E.2.4.25.1 Procedure for Airline Baggage Handling Staff

- Move personnel and baggage tub carts to the affected conveyors to assist BHS maintenance personnel in unloading bags from the SL1 line upstream to the fault and either placing them back on the line downstream of the fault or carrying them directly to tugs.

E.2.4.25.2 Procedure for TSA Staff

- Move additional personnel to the CBRA especially during peak hours due to possible high number of die backs on the BHS .

E.2.4.25.3 Procedures for BHS Maintenance Staff

- Asses fault and time necessary to correct.
- Manually remove all cleared bags from the line with the faulted conveyor and place them back on operational belts downstream of the fault and in case that the last conveyor on the line is faulted bags will be placed directly on the make up unit.
- Follow BHS maintenance standard procedures.
- Quickly correct point of failure.

E.2.4.26 ATR Failure

This is a potential disruption of some significance due to lack of mainline redundancy. The MU2 will be considered the primary default for this contingency. This make up does not use a diverter, thus avoids potential missed diverts, subsequently all bags reach this point.

E.2.4.26.1 Procedure for Airline Baggage Handling Staff

- Move personnel and baggage tub carts to designated default MU2.

E.2.4.26.2 Procedures for BHS Maintenance Staff

- Ensure the diverter for MU1 is placed in “Pass All” mode.
- Monitor capacity level at the MU in use.

- Ensure conveyor traffic flows without jams and other fault conditions.

E.2.4.27 MU Failure (MU1 or MU2)

The Terminal sort area does not include redundant transport lines for each make up. In case that one MU device failed the other one will be used. This will demand coordination between the affected carriers.

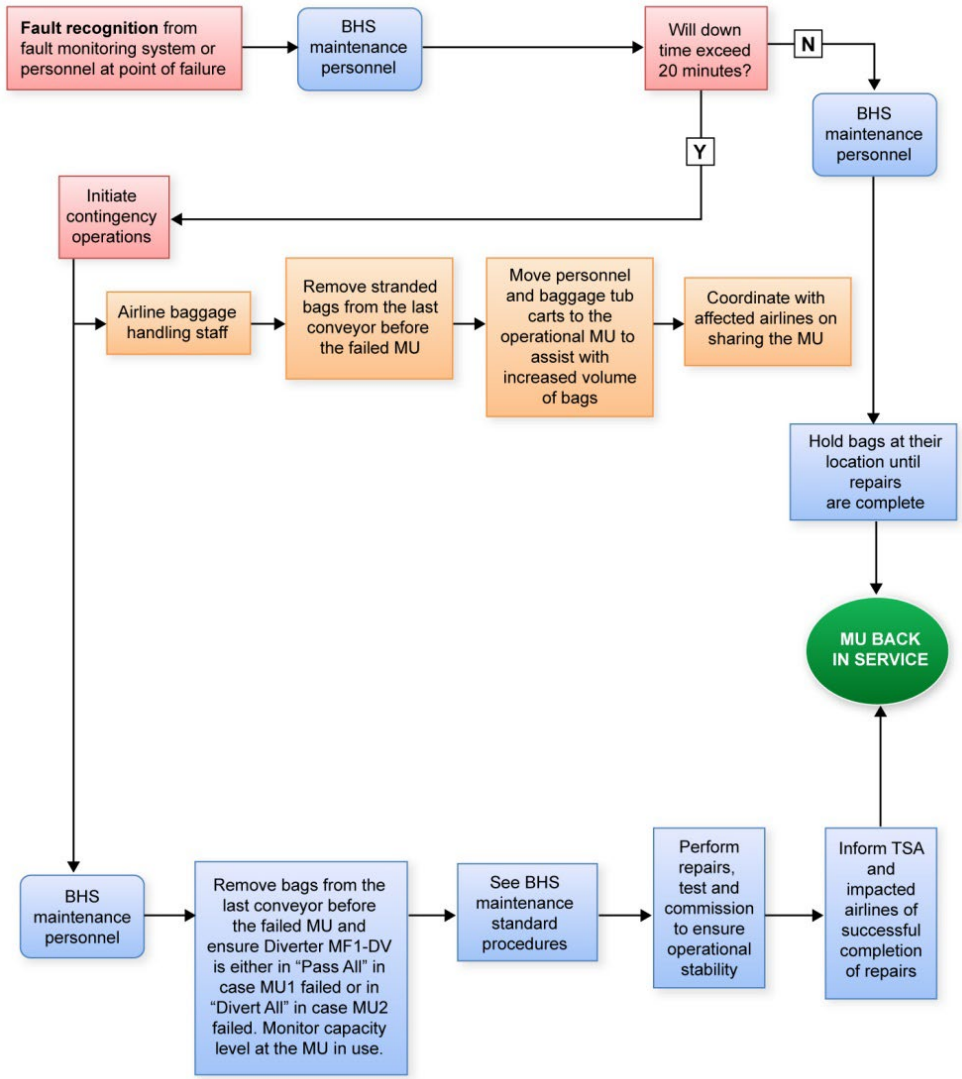
E.2.4.27.1 Procedure for Airline Baggage Handling Staff

- Move personnel and baggage tub carts to the MU in use to assist with the increased volume of bags.

E.2.4.27.2 Procedures for BHS Maintenance Staff

- Follow BHS maintenance standard procedures.
- Monitor capacity level at the MU in use.

MAKE UP FAILURE



E.2.4.28 CBRA Equipment Failure

E.2.4.28.1 Procedure for TSA Staff

- Move additional personnel to the CBRA.
- Alarmed bags entering the CBRA will need to be manually searched without direction if all HMI fails. If trace detection fails then all bags will need to be manually searched.
- Contact appropriate sources/vendors for repairing failed devices.

E.2.4.29 Treatment of Positively Identified Threat Bags by TSA Staff

When TSA staff cannot clear an alarmed bag following Standard Operating Procedures (SOPs) they shall contact the Airport Manager on Duty (MOD) as well as the Airports Designated Law Enforcement Officer (LEO) for resolution of the Identified Threat. Bags identified in the CBRA as a threat would require an immediate evacuation by staff. The Designated Law Enforcement Officer (LEO) then assumes full responsibility of the threat bag and his/her standard operating procedure shall be followed.

An accessible route has been provided to allow for any EOD robot access in and out of the CBRA where the threat bag will be located.

E.2.4.30 Power Loss

In the event of a system power loss, an Uninterruptible Power Supply (UPS) will allow the PLCs to retain all tracking data for a minimum of two (2) hours.

The UPSs provided for the EDS devices will allow for a controlled shut down of the x-ray gantry and screening computers.

In the event that any power failure results in an extended duration of the non-operable BHS TSA and MYR will proceed in fall back operations.

APPENDIX F:

RISK BASED SECURITY IMPACTS FOR THE ELECTRONIC BAGGAGE SCREENING PROGRAM

As of the date of this version of the PGDS, EBSP does not anticipate any impacts from RBS on CBIS designs or on the specifications contained in the PGDS that are not already taken into account in this version of the PGDS. The key requirements for RBS according to EBSP's current plans are having ATRs upstream of the EDS units, as detailed in Section 12.7.1.2, and having all infrastructure in place to support STIP for all screening equipment, as detailed in Section 16.8.

APPENDIX G:

REFERENCES

The PGDS was developed with reference to several documents and models previously developed by the US government and its contractors, as well as other standards organizations as discussed below:

G.1 Transportation Security Administration

- Recommended Security Guidelines for Airport Planning, Design and Construction, Revised May 2011

  This revised document was issued by TSA in May 2011 and presents recommendations for incorporating sound security considerations into the planning, design, construction, and modification of security-related airport facilities and airport terminal buildings. It consolidates information developed through the participation of TSA and other government and aviation industry professionals. The Recommended Security Guidelines document is intended to help users ensure that security considerations and requirements are a component of the planning and design of airport infrastructure, facilities and operational elements. Intended users include aviation user-agencies (airport operators, aircraft operators and airport tenants), airport planners and consultants, designers, architects, and engineers engaged in renovation and new airport facility planning, design or construction projects.

- Integrated Deployment Model

  As part of the BSIS, TSA also developed the Integrated Deployment Model, which is an economic model based on a life-cycle cost approach to screening system selection. The model is used to conduct a top-down evaluation of various schematic concepts of EDS screening systems, based on the methodologies outlined in this document. These schematic concepts take into account high-level spatial constraints at airport terminals and are optimally sized according to the estimated checked baggage demand. The concepts were then evaluated on the basis of the life-cycle costs of developing, maintaining, and replacing the EDS screening systems. Though schematic in nature, these concepts may serve as a useful starting point for any airport or airline that plans to implement a checked baggage screening system and would be made available upon request.

  The Integrated Deployment Model is a working model that will be continuously updated as new technologies are developed and performance characteristics are updated.

- Advanced Surveillance Program (ASP), TSA Baseline Video Surveillance Operational Requirements, Checked Baggage (draft)
- Checked Baggage Inspection System Interface Requirements Document (IRD) for BHS and In-Line Screening Device (ISD)
- Checkpoint Requirements and Design Guide. https://sam.gov/opp/0e0420dad5384ee594fcccf2fdc3bfe7/view
- *Electronic Baggage Screening Program Policy – TSA Funding of Checked Baggage Inspection System Project Costs*: SAM.gov
- *SSI Best Practices Guide for Non-DHS Employees and Contractors*: TSA.gov SSI webpage

Checked Baggage Program Contacts and Resources

- Guidance and FAQs on the funding and application processes can be found on TSA's EBSP webpage.
- Requests for CBIS changes: submit to TSA ATSA Branch at BASEteam@tsa.dhs.gov
- To obtain the most up to date information on qualified EDS, contact PGDS@tsa.dhs.gov.

G.2 Other Federal Agencies

- Centre for the Protection of National Infrastructure and the United States Department of Homeland Security, *Configuring and Managing Remote Access for Industrial Control Systems*, April 2011,
- Customs and Border Protection, Advance Passenger Information System (APIS), *Consolidated User Guide (CUG)*
- Department of Defense Design Criteria Standard: *Human Engineering* MIL-STD-1472G
- National Institute of Standards and Technology. NIST Special Publication SP 800-40 Rev. 3 Jul 2013 *Guide to Enterprise Patch Management Technologies* http://dx.doi.org/10.6028/NIST.SP.800-40r3
- National Institute of Standards and Technology. NIST Special Publication SP 800-41 Rev. 1 Sep 2009 *Guidelines on Firewalls and Firewall Policy* http://dx.doi.org/10.6028/NIST.SP.800-41r1
- National Institute of Standards and Technology. NIST Special Publication SP 800-61 Rev. 2 Aug 2012 *Computer Security Incident Handling Guide* http://dx.doi.org/10.6028/NIST.SP.800-61r2
- National Institute of Standards and Technology. NIST Special Publication SP 800-82 Rev.2 May 2015 *Guide to Industrial Control Systems (ICS) Security* http://dx.doi.org/10.6028/NIST.SP.800-82r2
- National Institute of Standards and Technology. NIST Special Publication SP 800-84 Sep 2006 *Guide to Test, Training, and Exercise Programs for IT Plans and Capabilities* http://dx.doi.org/10.6028/NIST.SP.800-84
- National Institute of Standards and Technology. NIST Special Publication SP 800-98 Apr 2007 *Guidelines for Securing Radio Frequency Identification (RFID) Systems* http://dx.doi.org/10.6028/NIST.SP.800-98
- National Institute of Standards and Technology. NIST Special Publication SP 800-100 Oct 2006 *Information Security Handbook: A Guide for Managers* http://dx.doi.org/10.6028/NIST.SP.800-100
- National Institute of Standards and Technology. NIST Special Publication SP 800-115 Sep 2008 *Technical Guide to Information Security Testing and Assessment* http://dx.doi.org/10.6028/NIST.SP.800-115

- National Institute of Standards and Technology. NIST Special Publication SP 800-153 Feb 2012 *Guidelines for Securing Wireless Local Area Networks (WLANs)* http://dx.doi.org/10.6028/NIST.SP.800-153
- National Institute of Standards and Technology. NIST Special Publication SP 800-167 Oct 2015 *Guide to Application Whitelisting* http://dx.doi.org/10.6028/NIST.SP.800-167
- United States Department of Homeland Security. (2009). Recommended Practice: Improving Industrial Control Systems Cybersecurity with Defense-In-Depth Strategies.
- United States Department of Homeland Security and Centre for the Protection Of National Infrastructure. (2011). *Configuring & Managing Remote Access For Industrial Control Systems.*
- United States Department of Labor, Occupational Safety & Health Administration Computer Workstations eTool, available at www.osha.gov/SLTC/etools/computerworkstations/index.html
- U.S. Department of Labor, Occupational Safety and Health Standards 29 CFR 1910

G.3 Industry Guidance Documents

- American National Standards Institute, ANSI/ISA-62443-1-1 (99.01.01)-2007 - Security for Industrial Automation and Control Systems Part 1-1: Terminology, Concepts, and Models
- American National Standards Institute, ANSI/ISA-62443-2-1 (99.02.01)-2009 - Security for Industrial Automation and Control Systems: Establishing an Industrial Automation and Control Systems Security Program
- American National Standards Institute, ANSI/ISA-TR62443-2-3-2015 - Security for industrial automation and control systems Part 2-3: Patch management in the IACS environment
- American National Standards Institute, ANSI/ISA-62443-3-3 (99.03.03)-2013 - Security for industrial automation and control systems Part 3-3: System security requirements and security levels
- American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE) Standard 62.1-2016 *Ventilation for Acceptable Indoor Air Quality*.
- Association for the Advancement of Cost Engineering (AACE) International, Recommended Practice No. 10S-90, *Cost Engineering Terminology,* copyright 2004.
- International Organization for Standardization (ISO) Standard ISO 11064-1: 1999, *Design of Control Centers. Part 1: Principles for the design of control centres*

- International Organization for Standardization (ISO) Standard ISO 11064-2: 1999, Design of Control Centers. Part 2: Principles for the arrangement of control suites
- International Organization for Standardization (ISO) Standard ISO 11064-3: 1999, *Design of Control Centers. Part 3: Control room layout*
- International Society of Automation and International Electro Commission, IEC TS 62443-1-1:2009 Industrial communication networks - Network and system security - Part 1-1: Terminology, concepts and models
- International Society of Automation and International Electro Commission, IEC 62443-2-1:2010 Industrial communication networks - Network and system security - Part 2-1: Establishing an industrial automation and control system security program
- International Society of Automation and International Electro Commission, IEC TR 62443-2-3:2015 Security for industrial automation and control systems - Part 2-3: Patch management in the IACS environment
- International Society of Automation and International Electro Commission, IEC 62443-2-4:2015 Security for industrial automation and control systems - Part 2-4: Security program requirements for IACS service providers
- International Society of Automation and International Electro Commission, IEC PAS 62443-3:2008 *Security for industrial process measurement and control - Network and system security*
- International Society of Automation and International Electro Commission, IEC TR 62443-3-1:2009 Industrial communication networks - Network and system security - Part 3-1: Security technologies for industrial automation and control systems
- International Society of Automation and International Electro Commission, IEC 62443-3-3:2013 Industrial communication networks - Network and system security - Part 3-3: System security requirements and security levels
- National Fire Protection Association (NFPA) 70, National Electrical Code and NFPA 101, Life Safety Code

G.4 Additional Cybersecurity Resources

National Institute of Standards and **Technology Information Technology Laboratory's** (ITL) two security divisions - Computer Security Division (CSD) and Applied Cybersecurity Division (ACD) – can be retrieved from: http://csrc.nist.gov/publications/index.html.

American National Standards Institute, International Society of Automation and International Electro Commission

The 62443 series publications can be obtained from one of the following:

- https://www.ansi.org/
- http://www.iec.ch/
- https://www.isa.org/

Department of Homeland Security Industrial Control Systems Cyber Emergency Response Team

The Department of Homeland Security Industrial Control Systems Cyber Emergency Response Team (ICS-CERT) works to reduce risks within and across all critical infrastructure sectors by partnering with law enforcement agencies and the intelligence community and coordinating efforts among Federal, state, local, and tribal governments and control systems owners, operators, and vendors. Additionally, ICS-CERT collaborates with international and private sector Computer Emergency Response Teams (CERTs) to share control systems-related security incidents and mitigation measures. The ICS-CERT provides many cybersecurity publications and resources. Publications can be viewed at:

- https://ics-cert.us-cert.gov/Recommended-Practices
- https://ics-cert.us-cert.gov/Standards-and-References

The ICS-CERT main page can be accessed at:

- https://ics-cert.us-cert.gov/

APPENDIX H:

REQUIREMENTS LISTS

APPLICABILITY REQUIREMENTS

Current Version: Designs for new CBISs shall comply with the requirements set forth in this version of the PGDS.

Prior Versions: Any project sponsor that has received formal confirmation from TSA of the receipt of the complete 30% Detailed Design Package for a CBIS project prior to the publication date of this version of the PGDS shall continue to be governed by the PGDS version in effect at the time of such confirmation. Furthermore, projects that have passed the 30% Detailed Design phase—including those systems currently under construction or in operation—with TSA approval shall be held to the design standards specified by that approval (either under the previous PGDS versions or prior standards in place before the publication of Version 1.0 of the PGDS).

CHAPTER 3: CBIS TYPES AND EQUIPMENT REQUIREMENTS

3.1 CBIS Overview: New CBIS designs shall not include legacy units.

3.1 CBIS Overview: The Project Sponsor shall coordinate with the TSA Project Coordinator for any needed SSI and to make a final determination on the conveyable bag dimensions.

3.2.1 In-Line CBIS: Throughput values used during design for system sizing shall be based on a site-specific bag sizes, which may differ from the assumed 28” average bag size used in Table 3.1.

3.3.2 Stand-Alone EDS: Stand-alone EDS layout designs shall ensure TSA personnel do not handle baggage more than 8 feet from the entrance or exit of the baggage screening location footprint (as validated by the local FSD) for the purposes of picking up a bag for screening or returning a screened bag to the aircraft operator.

3.3.2 Stand-Alone EDS: Silent duress alarms shall be installed at all stand-alone EDS Checked Baggage screening areas located in the public space.

3.4.1 Primary Screening: Silent duress alarms shall be installed at all ETD primary screening systems located in the public space.

3.5.1 Individual Carrier Systems: The Project Sponsor shall coordinate with TSA and OEMs to ensure the EDS-Carrier configuration is approved and an approval letter is obtained from the TSA program office prior to the 100% design phase.

3.5.1 Individual Carrier Systems: The average ICS carrier size shall be no larger than two standard deviations above the airport-specific average bag length, plus additional carrier length beyond maximum bag loading size required for operation specified by the ICS manufacturers.

3.5.1 Individual Carrier Systems: ICS throughput shall be calculated based upon the carrier size and the EDS manufacturer’s minimum spacing requirements.

3.5.1 Individual Carrier Systems: No ICS carrier design shall restrict the processing rate of any EDS machine to less than 400 bph.

CHAPTER 4: PROJECT PLANNING AND INITIATION

4.2.3 Project Sponsor: If an ILDT is not formed, the Project Sponsor shall assume the responsibilities of the ILDT as defined in Section 4.2.2.

4.3 Project Phases: All projects shall follow project phasing sequence Pre-Design Phase, Schematic Design Phase, Detailed Design Phase, Construction Phase, Testing and Commissioning Phase, and Project Closeout Phase.

4.3 Project Phases: Using the GFI request form found in Appendix A, the ILDT shall request airport-specific GFI from TSA, if available.

4.4 Design-Build Projects: Sponsors of projects anticipated for completion through a design-build contract, regardless of the design percentage at which the design-build contract is expected to be awarded, shall provide all documentation outlined in the PGDS.

4.4 Design-Build Projects: Documentation shall be provided in accordance with a schedule coordinated by the Project Sponsor and TSA to ensure applicability of the intended system to the guidelines and standards presented in the PGDS.

4.4 Design-Build Projects: Additionally, shop drawings and 70% progress drawings shall be provided for CBISs being constructed through design-build contracts to demonstrate that the system being constructed conforms to the design reviewed and approved by TSA.

4.5 Design Review Process: The Project Sponsor shall provide a written response to each TSA comment on the form and in the space provided.

4.6.1 Project Phases: During the entirety of the design phase:

- All formulas and calculations for figures shall be submitted.
- All PGDS or other TSA-provided rates and numbers shall be used in all submittals unless a RFV is submitted to and approved by TSA.
- All rates and numbers supplied in submittals shall be accompanied by all the supporting numbers and calculations.

4.6.2 Requests for Variation: The Project Sponsor shall submit a RFV for any PGDS requirement that cannot be met.

4.6.2 Requests for Variation: The ILDT shall assess all implications of an exemption from any requirements set forth in the PGDS due to local constraints and include full documentation supporting the request to the Project Sponsor.

4.6.2 Requests for Variation: Design package submittals shall include documentation of all RFVs associated with the CBIS project.

4.6.3 Submittals Formatting: All submittals shall be made electronically in print-ready PDF and shall include the following:

- The title of the design shall be located on the front page and in the footer section, and shall state the applicable PGDS version at the time.
- Each design package shall begin with a table of contents.
- All chapters/submittals shall be indexed electronically within the file.
- A table of contents listing headings and page numbers shall be included in the front of each submittal.
- Each chapter shall be identified with an electronic PDF bookmark.
- PDF file size shall not exceed 20 MB for any submittal items.

4.6.4 Electronic File Naming Convention: The electronic file names shall conform to the following convention:
ABC_XXXX_LOCATION_YYYYMMDD_TYPE_DESCRIPTION. EXT

4.6.5 Design Review Comment Form: The Project Sponsor shall provide written responses to each TSA comment and shall include a reference to the submittals sections where changes were made to address comments.

4.7.2 Use of TSA-Approved Equipment: When TSA funds the design and construction of a CBIS project, the project sponsor shall design their CBIS for incorporation of TSA-qualified EDS and ETD units.

CHAPTER 5: PRE-DESIGN PHASE REQUIREMENTS

5.3 Pre-design Phase Deliverables: The Pre-Design package shall include the deliverables described below: (see text for details)

- Alternatives Analysis Report
- Preliminary project schedule
- Preliminary contingency plan (only applicable to Mini-Inline systems at this phase)

5.5.1 Categorize the Airport into Screening Zones: All airlines (including charter airlines) operating in each screening zone shall be identified.

5.5.2 Determine Current Checked Baggage Demand: If available, FDRS data provided by TSA shall be used to determine the 95th percentile peak 10-minute demand for each screening zone. If GFI is not available, the FSA methodology shall be used to derive the ADPM peak 10-minute demand for each screening zone.

5.5.2.2(1) Flight Schedule Analysis Methodology: Only validated and TSA-approved flight schedules shall be used to determine ADPM.

5.5.2.2(1) Flight Schedule Analysis Methodology: For each screening zone, the total number of monthly originating bags and international recheck bags for all airlines in that zone shall be obtained and the peak month identified.

5.5.2.2(1) Flight Schedule Analysis Methodology: For each screening zone, the total number of daily originating and international recheck bags for all airlines in that zone during the peak month shall be calculated, and a mathematical average shall be derived.

5.5.2.2(2) Flight Schedule Analysis Methodology: Once the ADPM for each zone has been determined, that day's flight schedule for each screening zone shall be provided in MS Excel format. To identify outbound baggage demand, flight schedules shall only contain information on departing flights from the subject airport. Flight schedules shall specify for each flight: destination, flight departure time, flight number, published carrier, operator, aircraft type, and number of seats.

5.5.2.2(2) Flight Schedule Analysis Methodology: To derive international recheck baggage demand, the arrival schedule of international flights whose passengers will be connecting to domestic flights shall be provided.

5.5.2.2(4) Flight Schedule Analysis Methodology: The percentage of passengers arriving on international flights and connecting to domestic flights shall be used to derive international recheck baggage demand.

5.5.2.2(4) Flight Schedule Analysis Methodology: The estimated number of originating passengers shall be calculated by multiplying the number of seats by the load factor and by the percentage of originating passengers assumptions for the ADPM.

5.5.2.2(4) Flight Schedule Analysis Methodology: The estimated number of connecting passengers from international to domestic flights shall be calculated by multiplying the number of arriving seats by the load factor and by the percentage of connecting passengers assumptions for the ADPM.

5.5.2.2(6) Flight Schedule Analysis Methodology: The estimated number of originating checked bags shall be calculated by multiplying the estimated number of originating passengers by the number of checked bags per passenger assumptions for the ADPM.

5.5.2.2(6) Flight Schedule Analysis Methodology: The estimated number of international recheck bags shall be calculated by multiplying the estimated number of connecting passengers from international to domestic flights by the number of international recheck bags per passenger assumptions for the ADPM

5.5.2.2(7) Flight Schedule Analysis Methodology: The ratio of International and Domestic bags in the peak 10-minutes shall be used in CBIS equipment calculations.

5.5.3 Project Future Baggage Demand: Current baggage demand shall be projected to the Design Year to determine screening equipment requirements. The Design Year for equipment requirements shall be five years after the initial DBU for a given baggage screening system (i.e., DBU+5 years).

5.5.3 Project Future Baggage Demand: Current Demand shall be projected to DBU+15 for space planning purposes.

5.5.3 Project Future Baggage Demand: If, for any reason, local airport and airline staff and their consultants believe that the TAF or the Master Plan forecasts do not properly represent expected growth at the airport, the revised forecast and a detailed explanation of the reasons that the FAA-approved forecast is not acceptable shall be provided to TSA for approval.

5.6 Baggage Screening Equipment Requirements Determination: The EDS, OSR, and CBRA equipment requirements and associated screening demand shall be listed in the Basis of Design Report, from DBU through DBU+15 years. These equipment requirements shall be shown in a chart with 1-year increments expressed as calculated values (to the nearest tenth of a decimal point) as well as the rounded values. The equipment requirements for 10 additional years past DBU+5 years shall be used to support space allocation planning in CBRA and OSR.

5.6 Baggage Screening Equipment Requirements Determination: Equipment requirements shall be revalidated 12 months prior to equipment delivery. If EDS equipment type changes, the construction start date is delayed, or if the construction schedule causes delays more than 12 months beyond the expected DBU, then a revalidation of EDS and CBRA requirements shall be submitted.

5.6.2 Baggage Screening Equipment Requiremens Determination: In determining EDS equipment requirements, the 10-minute demand of the Design Year (DBU+5) shall be used.

5.2.6.1 Determine EDS Demand: (Applicable for FSA methodology only) The following formula shall be used to calculate each zone-specific surge factor:

$$\textbf{Surge Factor} = \frac{Adjusted\ Design\ Year\ Demand + 2\sqrt{Adjusted\ Design\ Year\ Demand}}{Adjusted\ Design\ Year\ Demand}$$

5.6.2.2 Calculate EDS Throughput: EDS throughput rates shall be calculated using the following formula:

$$Throughput_{EDS} = \left(\frac{EDS\ Belt\ Speed}{(29.3" \times \%\ Domestic) + (30.2" \times\ \%\ International) + bag\ spacing}\right) \times 95\%$$

where $Throughput_{EDS}$ = Number of bags screened per hour by the EDS.

5.6.2.3 Calculate Number of EDS Required: The number of EDS units required shall be calculated as follows:

$$N_{EDS} = \frac{EDS\ Demand \times 6}{Throughput_{EDS}}$$

where:

N_{EDS} = Number of EDS units

EDS Demand = 10-minute demand that will be screened by EDS units

$Throughput_{EDS}$ = Number of bags screened bags per hour by the EDS.

5.6.3 EDS Equipment Redundancy: A single redundant EDS machine shall not be shared between two EDS groupings.

5.6.3 EDS Equipment Redundancy: Redundant equipment shall only be provided when no lower-cost redundancies are possible.

5.6.4 OSR Station Requirements: The number of OSR stations (N_{OSR}) required shall be equal to the number of EDS machines including any redundant machines.

5.6.5 Baggage Inspection Station Requirements: The number of BISs to be installed shall be derived based on the total non-redundant EDS capacity. The size of the CBRA in terms of space allocation shall be based on the number of BISs derived based on the total EDS capacity.

5.6.5.1 Baggage Inspection Stations for Alarmed, Reinsert, and OOG Processing: The number of BISs to be installed shall be based on the number of non-redundant EDS machines.

5.6.5.1 Baggage Inspection Stations for Alarmed, Reinsert, and OOG Processing: For systems processing Alarmed+Reinsert+OOG bags on the same lines, the number of BISs to meet demand shall be calculated as follows:

- For a strictly Domestic operation, 4 BISs are allocated per non-redundant EDS machine.
- For a strictly International operation, 4.5 BISs are allocated per non-redundant EDS machine.
- For operations that include a percentage of International destinations in the peak hour, the number of BISs per non-reduntant EDS machine is pro-rated between 4 and 4.5 according to the Domestic/International ratio.
- The calculated number of BISs is half-rounded, where greater than or equal to 0.5 rounds up, and less than 0.5 rounds down.

5.6.5.1 Baggage Inspection Stations for Alarmed, Reinsert, and OOG Processing: For systems with separate Alarmed+Reinsert lines and OOG lines, the number of BISs to meet demand shall be calculated as follows:

- For a strictly Domestic operation, 3.3 BISs are allocated per non-redundant EDS machine for Alarmed+Reinsert bag processing and 0.7 BISs are allocated per non-redundant EDS machine for OOG bag processing.
- For a strictly International operation, 3.6 BISs are allocated per non-redundant EDS machine for Alarmed+Reinsert bag processing and 0.9 BISs are allocated per non-redundant EDS machine for OOG bag processing.
- For operations that include a percentage of International destinations in the peak hour, the number of BISs per non-redundant EDS machine for each group of lines is pro-rated between the values above according to the Domestic/International ratio.
- Rounding for the two groups of lines is as follows:
  - For Alarmed+Reinsert bag processing, the calculated number of BISs is half-rounded, where greater than or equal to 0.5 rounds up, and less than 0.5 rounds down.
  - For the OOG bag processing, the calculated number of BISs is rounded similar to the EDS rounding methodology; greater than or equal to 0.1 rounds up, and less than 0.1 rounds down.

5.6.5.1 Baggage Inspection Stations for Alarmed, Reinsert, and OOG Processing: For systems that do not use default average bag lengths as specified in Table 5.4, an RFV shall be submitted to deviate from the BIS-per-EDS requirement specified in this section.

5.6.5.2 Oversize Baggage Inspection Station Requirements: The number of BIS required to process Oversize bags shall be calculated using the following equation:

$$N_{OS} = \frac{N_{EDS} \times Throughput_{EDS} \times \%\ OS}{(Rate_{OS\ Domestic} \times \%\ Domestic) + (Rate_{OS\ International} \times \%\ International)}$$

Where:

N_{EDS} = number of non-redundant EDS

$Throughput_{EDS}$ = throughput of the EDS

% OS = percentage of OS bags

$Rate_{OS\ Domestic}$ = rate at which TSOs resolve domestic OS baggage via OS search Rate

$_{OS\ International}$ = rate at which TSOs resolve international OS baggage via OS search

5.6.6 ETD Machine Requirements: The number of ETD machines required shall be calculated as the number of BISs divided by two; fractional results are rounded up to the next whole number.

5.7.1 Alternatives Development: When developing the Alternatives Analysis report as stated in the requirements for Pre-Design Phase in Chapter 4, planners shall follow the requirements listed in Sections (Project Sponsor and ILDT Responsibilities), 5.6 (Baggage Screening Equipment Requirements Determination), and Chapter 11 (Life Cycle Cost Estimating).

5.7.1 Alternatives Development: Spatially and operationally feasible alternatives shall be evaluated on the basis of a 20-year life cycle cost analysis detailed in Chapter 11 for implementing, maintaining, and replacing the screening system.

5.7.1.4 Alternatives Equipment Requirements Estimation: For each alternative proposed, planners shall determine the CBIS type (e.g., in-line, mini In-line, stand-alone) and number of units required for each screening zone.

5.7.1.5 Alternatives Concept Definition: The ultimate terminal or airport capacity shall be the upper limit for demand estimates for the purposes of CBIS design.

5.7.2.3 Selecting the Preferred Alternative: Alternatives shall be evaluated on the basis of the present value of total life cycle costs, defined as the present value of the annual sum of capital, O&M, and staffing costs.

5.7.2.3 Selecting the Preferred Alternative: For the purposes of estimating the present value of these costs, planners shall use the 20-year Real Interest Rate on Treasury Notes and Bonds of Specified Maturities found in the latest version of the Office of Management and Budget Circular No. A-94, Appendix C, as the real discount rate.

5.7.2.3 Selecting the Preferred Alternative: Once the costs of all concept-level alternatives have been developed to include the full present value life cycle costs, alternatives shall be ranked based on present value life cycle costs and the lowest-cost alternative that meets all other requirements shall be selected as the preferred alternative.

5.8 Alternatives Analysis Report: The Alternatives Analysis Report shall include, at minimum:

- Background information, including
  - Current airport layout and airlines
  - Objectives for new CBIS
  - Growth potential and limitations
- Alternatives Development (Section 5.7.1)
  - Zoning Schemes
  - System Types
  - Preliminary Alternatives
  - Feasible Alternatives
- For each feasible alternative:
  - Baggage Screening Demand Determination (Section 5.5)
    - Baggage Demand Assumptions
    - Current Year Demand Determination
      - FDRS analysis (Section 5.5.2.1) OR
      - FSA (Section 5.5.2.2)
    - Design Year Demand Determination (Section 5.5.3)
      - Growth Methodology Substantiation
      - Growth Calculations
    - Screening equipment quantity requirements (Section 5.6)
- Quantitative Evaluation (Section 5.7.2.2, Chapter 11)
    - Life-cycle cost analysis assumptions
    - Life-cycle costs calculations for each alternative
- Qualitative Evaluation (Section 5.7.2.1)
- Selection of Preferred Alternative (Section 5.7.2.3)

CHAPTER 6: SCHEMATIC DESIGN PHASE REQUIREMENTS

6.3 Schematic Design Phase Deliverables: The Schematic Design package shall include:

- Basis of Design Report (Section 6.5) which adds the following elements to the approved Alternatives Analysis Report:
  - Detailed project requirements (Section 6.5.1)
  - EDS equipment make, model, and quantity that will be provided by TSA (Sections 6.2, 6.4)
  - Preliminary description of operations (Section 6.5.2)
  - Flow-based modeling assumptions and results (Section 6.5.3)
  - List of legacy EDS to be decommissioned (Section 6.5.4)
- Preliminary layout drawings of the CBIS (Section 6.6.1)
- Preliminary phasing plan (Section 6.6.3)
- Updated preliminary project schedule (Section 6.6.2)
- ROM preliminary Basis of Estimate document (Chapter 11)
- ROM estimate of probable construction costs (Chapter 11)
- EDS Maintenance and Environment Assessment of environmental conditions that will exist in the designed CBIS and environmental requirements of EDS units (Section 12.12.2)
- Contingency plan (Section 7.5, only applicable to mini in-lines at this phase)
- Stakeholder notification documentation (Section 6.6.8)
- Approved and in-process RFVs (Section 4.6.2)

6.5 Basis of Design Report: The BDR shall include, as designated for each phase:

- Approved Alternatives Analysis Report (Section 5.7.2)
- Detailed project requirements (Section 6.5.1)
- EDS equipment make, model, and quantity that will be provided by TSA (Sections 6.2, 6.4)
- Description of Operations (Section 6.5.2)
- Flow-based modeling assumptions and results, including time-in-system and BTT analyses (Section 6.5.3)
- List of legacy EDS to be decommissioned (Section 6.5.4)

6.5.1 Project Requirements: The project requirements discussion shall include, at minimum:

- Planning assumptions
- A system evaluation of the approved alternative
- Specific reference to the EDS type that TSA approved in the Alternatives Analysis Report to perform the screening function

- Indication of preferred equipment model and quantity at Schematic Design and specific reference to equipment TSA has committed to provide in subsequent phases
- Constructability technical memoranda documenting project-specific issues for each discipline, including CBIS design and architectural, structural, mechanical, plumbing, electrical, and communications considerations
- Demolition requirements describing what will need to be removed in order for the CBIS project to move forward

6.5.2 Description of Operations: At the Schematic Design Phase, the description of operations shall describe the preliminary operational concept.

6.5.2 Description of Operations: At the 30% Detailed Design Phase, the Description of Operations shall describe, at a high level:

- How the overall CBIS is intended to work, with references to how requirements in Chapter 12 will be met
- How OSR is intended to work, with references to how requirements in Chapter 13 will be met
- How CBRA is intended to work, with references to how requirements in Chapter 14 will be met
- How the CBIS integrates with the airport BHS, including contrasting baggage rates and controls methodology

6.5.2 Description of Operations: At the 70% Detailed Design Phase, the Description of Operations shall describe:

- Refinements to the 30% design Description of Operations
- Detailed OS and OOG Description of Operations
- Operational description of how the “no-lift” policy will be met in the CBRA

6.5.2 Description of Operations: At the 100% Detailed Design Phase, the Description of Operations shall include final refinements to all topics covered in the 70% design Description of Operations.

6.5.3 Flow Based Modeling: The flow-based modeling discussion shall:

- Identify the paths used for the high-level flow-based modeling calculations on plan view drawings
- Identify the assumptions used for the flow modeling
- Provide time-in-system analysis results including maximum baggage time in system by calculating the shortest and longest times that
  - An in-gauge bag will travel through the system as measured from the natural points of bag induction through an EDS, into and out of the CBRA
  - An OOG bag will travel from natural induction into and out of the CBRA
- Provide bag travel time analysis results to demonstrate adequate time for OSR

6.5.4 EDS to Be Decommissioned: The project sponsor shall submit a list of EDS equipment, by make, model, and serial number, that will be decommissioned after the proposed in line system is operational.

6.6.1 Schematic Drawings: the following requirements apply for all submissions:

- All drawing packages shall begin with a cover sheet and index.
- Each drawing shall have a title box. The drawing title box shall be clearly labeled with a construction phase number, where applicable
- Each drawing shall include a legend.
- Each drawing shall show standard details for the drawing type (structural, mechanical, electrical, etc
- Each drawing shall label conveyors and components, if known.
- Each drawing shall show dimension of points of intersection.
- Each drawing package submittal shall include an enlarged single-sheet plan view of the CBIS and an enlarged single-sheet plan vew of the CBRA.

6.6.1 Schematic Drawings: Closeout phase as-built drawings shall be 1/4" scale for elevation views and 1/8" scale for plan views, except for the BIS plan view, which shall be enlarged to 1/2" scale

6.6.1 Schematic Drawings: In the Construction Phase, TSA shall be provided with courtesy copies of shop and installation drawings to ensure the original intent of the design as reviewed up to and including the 100% design review submittal process

6.6.1 Schematic Drawings: Schematic Design Phase, Detailed Design Phase, and Closeout Phase drawings shall include the elements in Table 6.1 marked as "Required" for the indicated project phase.

6.6.2 Project Schedule: The project schedule shall include, at a minimum, the following milestones:

- Design OTA Period of Performance Start
- Design Consultant Notice to Proceed
- Pre-Design delivery to TSA for review
- Pre-Design – TSA Review
- Schematic design delivery to TSA for review
- Schematic design – TSA review
- 30% design delivery to TSA for review
- 30% design – TSA review
- 70% design delivery to TSA for review
- 70% design – TSA review
- 100% design delivery to TSA for review
- 100% design – TSA review
- RFP release
- Bid selection process completion
- Design OTA Period of Performance End
- EDS Delivery (if phased delivery is planned, provide delivery dates per phase)
- EDS Installation (if phased installation is planned, provide installation dates per phase)

- Testing (SAT, Owner testing, TRR, ISAT, Live Operations, and Run-In period)
- EDS Decommission Dates

6.6.3 Phasing Plan: Phasing plans shall include:

- Plan view drawing package showing conveyor layout and BHS/EDS components of the CBIS (i.e., ATRs, BMAs, EDS, CBRA BRPs) at each construction phase
- Brief description of the state of the system represented in each phase drawing, including:
  - The major functional changes of the CBIS in each phase (e.g., what components are removed/replaced, what major additions are made to the network or subsystems)
  - Whether the CBIS will be used operationally following each phase, and a brief description of how operations would be conducted (e.g., which induct points, which screening lines, is CBRA temporary or final configuration, etc.)
  - Number and type of each EDS populating screening lines in each phase
- Schedule showing when each phase is anticipated amongst other major activities impacting the system state by the BHSC and EDS OEM (e.g., high level of demolition and construction, networking and integration work, etc.)

6.6.4 Screening Equipment Installation Guidelines References: Submittals shall reference manufacturer's site-installation and integration guides (including document name, date, and revisions) and describe how requirements for the satisfactory accommodation of the selected screening equipment will be met, including requirements for EDS ancillary equipment and their respective spaces.

6.6.4 Screening Equipment Installation Guidelines References: HVAC requirements (EDS, CBRA, OSR, IT closets, etc.) associated with spaces housing screening equipment and associate ancillary equipment shall also be confirmed.

6.6.5 Conveyor Manifest: Starting at the 30% Design Phase, the conveyor manifest shall list, for each planned conveyor in the system:

- Conveyor identifier
- Approximate conveyor length
- Conveyor speed

6.6.5 Conveyor Manifest: Starting at the 70% Design Phase, the conveyor manifest shall include:

- Conveyor motor sizing
- Conveyor motor amperage
- Total amperage requirements

6.6.6 Specifications: Project specifications shall make explicit reference to TSA-specified CBIS design performance requirements in Chapters 12, 13, and 14.

6.6.6 Specifications: Project specifications shall reference current commissioning requirements outlined in Chapter 12 and Appendix D.

6.6.6 Specifications: Project specifications shall include detailed BIS requirements.

6.6.7 Bid Documents: Bid documents are submitted at the 100% Design Phase and shall include:

- Cover sheet with noted stakeholders, project locale, title, dates, revision block
- Drawing index
- Legend sheet
- Mechanical
  - Conveyor manifest sheets
  - Plan views, including catwalk, stairs, and egress
  - Elevation views
  - Project specific/standard details
  - Phasing drawings
  - Demolition requirements
  - Electrical
    - Control stations/devices/MCP locations
    - E-stop zones, with relevant control station
- Demolition and phasing plans
- EDS unit removal route as well as all other O&M-related access
- CBRA plans

6.6.8 Stakeholder Notification: Design package submittals shall include documentation that project stakeholders have been periodically briefed on the progress of the planning and design effort.

CHAPTER 7: DETAILED DESIGN PHASE REQUIREMENTS

7.2.2 30% Design Deliverables: The 30% design package shall include the following documents, which shall be delivered both in the native format (Word, Excel, etc.) and as a PDF file (hard copies are not required):

- Updated Basis of Design Report (Section 6.5) with emphasis on:
  - Updated project requirements (Section 6.5.1)
  - Refined flow-based modeling assumptions and results (Section 6.5.3)
  - Detailed discussion of operations (Section 6.5.2)
- Preliminary Drawings for mechanical, electrical, plumbing, fire protection, and special systems (Section 6.6.1)
- Updated preliminary phasing plan (Section 6.6.3)
- Updated project schedule (Section 6.6.2)
- Basis of Estimate, 30% Current Working Estimate, and, if applicable, updated LCCA (Chapter 11)
- Contingency plan (Section 7.5; only applicable to mini in-lines at this phase)
- Baggage and data flow charts (detailed data flow and examples are in Appendix A, Section A.3)
- Conveyor manifest (Section 6.6.5)

- Screening Equipment Installation Guideline References (Section 6.6.4)
- Outline of Reporting Capabilities to be provided by the CBIS (12.13) (see Appendix A, Section A.4 for examples of detailed reports)
- National Environmental Policy Act form (Section IV of TSA form 2601-1)
- Stakeholder notification documentation (Section 6.6.8)
- Approved and in-process RFVs (Section 4.6.2)

7.2.2 30% Design Deliverables: [The 30% design package] Preliminary plans for all disciplines include:

- Plan views of outlined conveyors and rights of ways, mechanical elements, UPS and power pole locations , EDS locations and CBRA areas
- EDS unit removal route with locations of quick disconnect conveyors as well as all other O&M-related access
- Inclines and declines
- Conveyor delineations, especially near the EDS units and in the CBRA
- Conveyor identification (ID) labels
- Elevations of significant areas (floor and wall penetrations, steep gradients, congested areas)
- Top of Bed approximate elevations
- Approximate MCP locations

7.2.4 Dynamic Modeling: If dynamic modeling is used, the modeling provider shall submit to the Project Sponsor and the TSA Project Coordinator all programming parameters that may be used to adjust the model including but not limited to:

- Bag distribution methodology
- Belt speeds
- Merge windows
- Spacer/bag gap timers
- Jam timer
- Space programmed between bags for diverting
- Bag spacing at vertical sortation units
- All statistical distributions used

7.3.2 70% Design Deliverables: The 70% design package shall include the following documents:

- Updated Basis of Design Report (Section 6.5) with emphasis on:
  - Updated project requirements (Section 6.5.1)
  - Refined flow-based modeling assumptions and results (Section 6.5.3)
  - Refined detailed discussion of operations (Section 6.5.2)
- 70% Design Drawings for mechanical, electrical, plumbing, fire protection, and special systems (Section 6.6.1)
- Updated phasing plan (Section 6.6.3)
- Updated project schedule (Section 6.6.2)
- Basis of Estimate, 70% Current Working Estimate, and, if applicable, updated LCCA (Chapter 11)

- Preliminary contingency plan (see Section 7.5)
- Baggage and data flow charts (detailed data flow and examples are in Appendix A, Section A.3)
- Updated conveyor manifest (Section 6.6.5)
- Screening Equipment Installation Guideline References (Section 6.6.4)
- Outline of Reporting Capabilities to be provided by the CBIS (12.13) (see Appendix A, Section A.4 for examples of detailed reports generated)
- National Environmental Policy Act form (Section IV of TSA form 2601-1)
- Draft Site-Specific Configuration Management Plan (Section 7.3.4)
- 70% Specifications (Section 6.6.6)
- Stakeholder notification documentation (Section 6.6.8)
- Approved and in-process RFVs (Section 4.6.2)

7.3.4 Configuration Management: The Configuration Management Plan shall follow the outline below:

1 Introduction
  1.1 Background
  1.2 Purpose
  1.3 Configuration Management Defined
2 Organizational Construct – Configuration and Organization Integration Baseline
  2.1 Airport Roles and Responsibilities
  2.2 TSA Roles and Responsibilities
  2.3 Airlines Roles and Responsibilities
3 Configuration Control: Management, Organization, and Responsibilities
4 Configuration Control Board
  4.1 Purpose
  4.2 Organization and Membership
  4.3 Change Request Process and Protocol
  4.4 Communications Management Plan
    4.4.1 Post Commissioning Change Management
    4.4.2 Documentation and Audit

7.4.2 100% Design Deliverables: The 100% design package shall include the following documents:

- Final Basis of Design Report (Section 6.5) with emphasis on
  - Final project requirements (Section 6.5.1)
  - Final flow-based modeling assumptions and results (Section 6.5.3)
  - Final detailed discussion of operations (Section 6.5.2)
- 100% Design Drawings for mechanical, electrical, plumbing, fire protection, and special systems (Section 6.6.1)
- Final phasing plan (Section 6.6.3)

- Updated project schedule (Section 6.6.2)
- Final Basis of Estimate, 100% Current Working Estimate, and, if applicable, updated LCCA (Chapter 11)
- Final contingency plan (Section 7.5)
- Baggage and data flow charts (detailed data flow and examples are in Appendix A, Section A.3)
- Final conveyor manifest (Section 6.6.5)
- Screening Equipment Installation Guideline References (Section 6.6.4)
- Outline of Reporting Capabilities to be provided by the CBIS (12.13)
- National Environmental Policy Act form (Section IV of TSA form 2601-1)
- Final Site-Specific Configuration Management Plan (Section 7.3.4)
- 100% Specifications (Section 6.6.6)
- Bid Documents (Section 6.6.7)
- Stakeholder notification documentation (Section 6.6.8)
- Approved RFVs (Section 4.6.2)

7.5.1 Contingency Planning Requirements: The Project Sponsor, CBIS design teams, and other stakeholders, such as airports, airlines, TSA FSD, TSA Headquarters, and all other relevant Federal, state, and local authorities, shall mutually develop a set of agreeable mitigation measures within a comprehensive contingency plan during the design process.

7.5.1 Contingency Planning Requirements: Preliminary contingency plans shall include, at minimum:

- Mitigation for short-, medium-, and long-term screening equipment failure
- Mitigation for short-, medium-, and long-term conveyance equipment failure
- Mitigation for short-, medium-, and long-term loss of utility power
- Mitigation for unplanned surges in system demand

7.5.1 Contingency Planning Requirements: Final contingency plans shall include, in addition to the requirements for preliminary contingency plans:

- Diagrammatic depictions of baggage screening contingencies and mitigation methods
- Description of the conditions that would trigger mitigation measures
- Protocols for operation
- A directory of all project stakeholders with direct responsibilities for operation of the CBIS

7.5.1 Contingency Planning Requirements: The Project Sponsor shall include contingency plans for extraordinary circumstances when baggage demand exceeds CBIS capacity, whether as the result of the failure of CBIS (EDS or BHS) components or peak baggage flow that exceeds the maximum capacity of the CBIS.

7.5.1 Contingency Planning Requirements: The Project Sponsor shall include contingency plans for instances where alarm bags at the CBRA that cannot be cleared using directed search with ETD need to be transferred for further inspection by law enforcement (typically a bomb disposal squad).

7.5.3.1 Programming Logic: The bypass feature shall be enabled and disabled via an operator's workstation in the BHS control room.

7.5.3.1 Programming Logic: If a Recovery Mode is created, the following requirements apply:

- The Project Sponsor shall obtain a TSA-approved RFV (during design) to operate the mainline above the non-redundant EDS capacity requirement. (See Section 12.3.1.)
- A Memorandum of Understanding (MOU) shall be created by the Project Sponsor during the 30% Design Phase and signed by the Project Sponsor, Major airlines involved and the FSD, which specifies an agreement by all parties regarding how the Recovery Mode will operate, how it is activated, who is notified of activation, etc.
- Recovery Mode shall be automatically deactivated once it is no longer needed, according to triggers defined during design (e.g., imminent dieback in CBRA or post-EDS, sustained reduced demand for a pre-determined amount of time, etc.)
- Any system operating with a Recovery Mode shall report metrics about the frequency and duration of usage in the BHS reporting.
- Any system operating with a Recovery Mode shall be tested against the Total EDS Throughput Rate (including redundant EDS) during System Throughput testing.
- Definition of Recovery Mode details and testing and validation plans shall be thoroughly presented in the Basis of Design report.

CHAPTER 8: CONSTRUCTION PHASE REQUIREMENTS

8.2 Project Sponsor and ILDT Construction Phase Responsibilities: The following requirements shall be adhered to during the Construction Phase, regardless of project type (design-bid-build versus design-build): (requirements listed separately)

8.2 Project Sponsor and ILDT Construction Phase Responsibilities: To ensure TSA's complete understanding and acceptance of the projected system performance, any changes or amendments to the approved 100% design, including contract document addenda, change requests and RFIs, that affect the functionality of the CBIS shall be presented for approval to TSA. Any variation from the 100% approved design will not be funded without prior TSA approval of the changes.

8.2 Project Sponsor and ILDT Construction Phase Responsibilities: Construction schedules shall include at a minimum key milestones for project completion such as: (see text for details)

8.2 Project Sponsor and ILDT Construction Phase Responsibilities: TSA Deployment, through its contractor, distributes the uncompleted Pre-ISAT Project Portfolio Checklist to the Project Sponsor at no less than 120 days before the planned start of ISAT testing, and the project sponsor shall provide Acceptance Testing this completed checklist and the site documentation it defines no less than 90 days before the planned start of ISAT testing.

8.2 Project Sponsor and ILDT Construction Phase Responsibilities: The Project Sponsor shall submit an updated Construction Schedule to TSA stakeholders at a minimum of every 30 days after construction award. Most projects conduct a weekly meeting to review project status and shall invite a TSA Deployment representative.

8.2 Project Sponsor and ILDT Construction Phase Responsibilities: The project sponsor shall request an update of the availability of equipment and equipment upgrades.

8.2 Project Sponsor and ILDT Construction Phase Responsibilities: The Project Sponsor shall consult with the TSA Project Coordinator and their TSA Acceptance Testing representative no later than 90 days prior to ISAT to refine projected commissioning durations.

8.3 Construction Phase Deliverables: The Construction Phase deliverables shall include the following documents:

- Any changes or amendments to the approved 100% design package including contract document addenda, change requests and RFIs
- Courtesy copies of shop and installation drawings to ensure the original intent of the design as reviewed up to and including the 100% design review submittal process
- Updated project schedule with construction milestones
- Power System Engineering Analysis
- Cybersecurity plan
- Cybersecurity Incident handling plan

8.5 Meetings: Regular meetings shall be conducted with the Project Sponsor/ILDT and TSA to monitor system construction.

5.6 Construction Schedule: Key construction milestones for project completion shall be included in the Project Schedule such as:

- Construction notice to proceed
- CBIS construction prior to EDS delivery and post-EDS delivery
- EDS delivery
- EDS power readiness and installation
- EDS SAT complete
- EDS integration and network installation
- Project Portfolio Checklist received and completed
- Pre-ISAT
- TRR
- ISAT
- Live bag screening
- 30-day run-in
- Completion of all required deficiency corrections
- Substantial completion
- Project closeout

5.6 Construction Schedule: At a minimum, the following ISAT durations shall be used as initial inputs to the construction schedule with the type of ISAT test being conducted (single-phase or multi-phase):

- Single-Phase ISAT:
  - One business day for mobilization to site
  - One business day per EDS spur line

  - Three business days for system testing (one business day each for System Mixed Bag, System Full Load, and System Throughput tests)
  - One business day for outbrief and demobilization
- Multi-Phase ISATs, each phase (except for final phase):
  - One business day for mobilization to site
  - One business day per EDS spur line not tested in previous phase
  - Two business days for system testing (System Mixed Bag and System Full Load)
  - One business day for outbrief and demobilization
- Final Phase:
  - One business day for mobilization to site
  - One business day per EDS spur line not tested in previous phase
  - Three business days for system testing (System Mixed Bag, System Full Load and System Throughput) conducted across all EDS in final form
  - One business day for outbrief and demobilization

8.7 System Change Implementation and Test Data: A descriptive summary narrative of the procedures and protocols in place to implement, test, and document changes made to the CBIS post-ISAT shall include at a minimum the items listed in this section.

8.7.1 CBIS Change Requests: TSA's CCR form shall be used for all pre- and post-ISAT change requests. All requests for changes shall be submitted to TSA ATSA Branch at BASETeam@tsa.dhs.gov.

8.7.1 CBIS Change Requests: When any change to the CBIS is required during the TRR, a change request shall be submitted to and approved by TSA's Site Integration (SI) contractor prior to implementation.

8.7.1 CBIS Change Requests: When any change to the CBIS is required post-TRN, between the Test Readiness Review and the completion of ISAT, a change request shall be submitted to and approved by TSA's Acceptance Testing contractor prior to implementation.

8.7.1 CBIS Change Requests: When any change to the CBIS is required post-ISAT, a change request shall be submitted to and approved by TSA ATSA Branch prior to implementation.

8.7.1 CBIS Change Requests: Upon completion of the approved CCR, all required documentation and updated PLC code as required in the CCR shall be submitted to ATSA Branch at BASEteam@TSA.DHS.gov.

8.7.2 Change Request Log: A log of each change made to the CBIS post-ISAT shall be maintained. This log shall be included in the change request submittal for TSA approval. The log shall include the following data at a minimum:

- CBIS designation
- Name of persons implementing the change
- Description of change
  - Reason for the change (i.e., problem being resolved)
  - Expected resolution
- Identification / location of the change

  - Name of device (e.g., PLC-1, HM1-1, SC-1, etc.)
  - Name of program / subprogram
  - Location in the program / subprogram (e.g., rung 1, line 1, etc.)
- Test methodology
  - Description of test
  - Expected results

8.7.3 TSA Approval: The proposed change shall be implemented for testing and live operations if and only if approved by the TSA. The testing results shall be submitted to the TSA within five business days upon the completion of testing.

8.7.4 Testing Procedures: Testing procedures shall be developed and followed during any BHS testing on the CBIS post-ISAT. At a minimum, the procedures shall include:

- Available times for testing
- Contingency plan
- Documentation
  - Definition of testing process
  - Software download / upload
  - Hardware modification / restoration
- Wiring modification / restoration
- Notification to all stakeholders
  - Testing Period
  - Live Operations

8.7.5 Test Results: Empirical data shall be recorded during testing. A summary of the data shall be provided explaining how the collected data met (or did not meet) the expected results.

8.8.1 Training Deliverables: Training materials and documentation to be presented shall be submitted to TSA for review 60 days prior to the first scheduled training session.

8.8.2 CBIS Use and Logistics Training: CBIS use and logistics training, distinct from maintenance training, shall be provided by the Project Sponsor to TSA for mechanical, electrical, and computer functions required to properly operate the staffed portions of the system including, but not be limited to:

- Any BHS-provided equipment in the CBRA
- Bag induction and handling procedures
- Any BHS-provided equipment in the OSRA
- BHS control interface provided to conduct the IQT procedures
- CBIS orientation and layout
- CBIS fail-safe procedures and layout
- System safety

- Bag jam and fault clearing procedures
- BHS reporting system

8.8.2 CBIS Use and Logistics Training: The BHSC shall provide training on how to access and download BHS reports as well as SSI training for any BHS reports classified as SSI; training must comply with Federal Government SSI guidelines. SSI Best Practices and Quick Reference Guides for more information on SSI handling, sharing, and destroying procedures can be found on the TSA.gov SSI webpage.

8.4.1 CBIS Use and Logistics Training: All operators or individuals with access to either viewing or printing reports shall have completed SSI procedures training prior to operation. The training sessions shall be conducted prior to the operational startup of the respective BHS.

CHAPTER 9: TESTING AND COMMISSIONING PHASE REQUIREMENTS

9.2 Pre-Commissioning Requirements: All IATA tags for all phases of BHS testing, Pre-ISAT, TRR, and ISAT shall be provided by the airport or airline tenant.

9.2 Pre-Commissioning Requirements: These tests shall be conducted in accordance with the requirements set forth in Appendix D. In the case of an independently conducted Pre-ISAT, the project sponsor shall provide a TRR Readiness confirmation letter documenting the successful demonstration and acceptance of Pre-ISAT test results to the TSA DSD following the completion of Pre-ISAT testing and prior to the start of TRR Testing.

9.2 Pre-Commissioning Requirements: The project sponsor shall also provide copies of all unlocked PLC code to DSD prior to ISAT testing .

9.2 Pre-Commissioning Requirements: From the TRR forward, the Project Sponsor shall ensure that change management processes are stringently adhered to. Section 8.7 details the conditions under which change requests must be initiated. In addition to the process outlined in Appendix D, a benchmarked copy of the PLC program controlling CBIS components from induction points to the cleared bag sortation ATR shall be submitted at the following points:

- Post-ISAT
- Post-Operational Run-In

9.2 Pre-Commissioning Requirements: PLC code representing the CBIS under test shall be provided to TSA's Acceptance Testing Contractor at ISAT, and PLC code representing the post-operational run-in state shall be provided to TSA's Acceptance Testing Contractor during on-site observations for the run-in period or be submitted remotely upon successful completion of the run-in period if observations are not made. Passwords for any and all portions of "locked" PLC code shall be provided along with the code.

9.2 Pre-Commissioning Requirements: If the CBIS fails the TRR, subsequent testing shall be conducted at intervals of no less than 14 calendar days.

9.2 Pre-Commissioning Requirements: A combined pre-ISAT/TRR shall be conducted with the ISAT scheduled separately when there are multiple EDS, multiple changes to the in-feed or out-feed, or changes to the OSR or CBRA subsystem.

9.2 Pre-Commissioning Requirements: Logistical and labor support shall include at minimum:

- Operational EDS Network Printers to print EDS images
- Operational BHS network printers to print BHS reports
- Baggage handlers to assist in bag induction
- Tugs and carts to move test bags to test locations
- Fork lift support for TSA-owned Unit Load Devices that transport test bags
- Bag tags for test bags
- Secure storage space for test bags
- SIDA badging support for TSA contractor test team
- SIDA escort support

9.2 Pre-Commissioning Requirements: ISAT testing shall occur not more than 30 Calendar days prior to the commencement of Live bag screening (Run-In-Period). If the CBIS fails the ISAT conducted by TSA, subsequent testing shall be conducted at intervals of no less than 30 calendar days.

9.2 Pre-Commissioning Requirements: The Run-In Period shall consist of an initial 14-day period to collect operational data (BHS and EDS) to support a thorough analysis that accurately depicts the system performance.

9.2 Pre-Commissioning Requirements: During the Run-In period, the Project Sponsor or its designees shall submit weekly data reports in electronic format, preferably in PDF or native CSV file format to the TSA Acceptance Testing Contractor. These reports shall include all BHS reports required by PGDS Section 12.13 (CBIS Reporting Requirements) as well as select EDS reports.

9.2 Pre-Commissioning Requirements: Upon notification from TSA APM that a Post-ISAT Audit has been directed, the authority with jurisdiction at the airport (along with local TSA) shall submit to the TSA Acceptance Testing Contractor and the TSA ATSA Branch, the immediate past 30 days of BHS and EDS reports in electronic format, preferably in native CSV or PDF format. These reports shall include all BHS reports required by PGDS Section 12.13 (CBIS Reporting Requirements) as well as select EDS Reports.

9.2 Pre-Commissioning Requirements: Any CBIS components not in final configuration, or any situation requiring phased commissioning shall be submitted to TSA for approval using the Request for PGDS Variance Template prior to the start of TRR testing.

9.3 Testing and Commissioning Phase Deliverables: The Testing and Commissioning Phase deliverables shall include the following:

- Pre-ISAT documentation, which may include the BDR, CONOPS Documents, Project Schedule, Bag Hygiene Policy, Jam and Fail-Safe Clearing Procedures, Integration Specifications, System Drawings, and Phasing Plan.
- Run-in and Closeout documentation, which may include a Data Analysis Plan and requested BHS and EDS reportsChapter 10: Project Closeout Phase Requirements

CHAPTER 10: PROJECT CLOSEOUT PHASE REQUIREMENTS

10.2 Project Closeout Phase Deliverables: The Project Closeout Phase deliverables shall include the following:

- As-built CBIS documentation shall be submitted to TSA, in both Computer-Assisted Design (CAD) and PDF file format, as follows:
  - Final Description of Operations (Section 6.5.2)
  - A complete set of BHS as-built mechanical, electrical, plumbing, fire protection, and special systems drawings (Section 6.6.1)
  - Final conveyor manifest (Section 6.6.5)
- Control System Architecture Documentation (Section 10.3)
- The PLC program (Section 10.3.3)

10.3.2 Submittal Format: The submittal data described in this section shall be submitted to the TSA as follows:

- 30-Day Post DBU Submission: Within 30 days following DBU, the initial submittal, as defined in Section Chapter 9, shall be made.
- Submission Procedure: Submission of all data shall be coordinated with the FSD or designee. All data shall be submitted via electronic files – paper copies will not be accepted.

10.3.2.1 Summary: A descriptive summary narrative of the submittal shall be included in Microsoft Word and PDF format. This summary shall include, at a minimum, the following information:

- Airport name and area of the airport included in the submittal such as terminal, matrix, node, etc.
- Description of the included area including:
  - Number and type of EDS units
  - Type and quantity of infeed conveyor systems such as ticket counter sub-systems, curbside sub-systems, mainlines, etc.
  - Type and quantity of outfeed conveyor systems such as mainlines to sort piers, make-up units, etc.
- Description of the conveyors / sub-systems and their controller equipment. At a minimum, the following information shall be provided:
  - List of each PLC and the conveyors / sub-systems it controls
  - List of each MCP and the conveyors / sub-systems it controls
- Contact information for:
  - Airport director, engineering manager or other primary contact point responsible for this CBIS
  - Airlines primary contact for this CBIS
  - Operation and maintenance contractor (if applicable) primary point of contact
  - Point of contact responsible for follow-up submittals

10.3.1.2 Index: An index of the documents included in the submittal shall be included. This index shall be submitted in Microsoft Excel and PDF format. The index shall include, at a minimum, the title of each file, the file date and the electronic file name.

10.3.2 Control System Architecture Drawing: A control system architecture drawing shall be summated for each CBIS. This drawing shall be submitted in DXF and PDF format. All high and low level networks shall be included. Detail shall be down to the motor control panel or PLC chassis level for high-level networks. Detail shall be down to the PEC or control devices for low level networks. Configuration information such as node numbers and IP addresses shall be included.

10.3.3 PLC Code and Associated Configuration Information: The low level, or PLC control, submission shall include the following at a minimum:

- **PLC Program**: A copy of the PLC program shall be submitted in its native format for all PLCs included as a part of the CBIS. This shall include any redundant PLCs that may exist. All software keys and or passwords shall be provided if programs are protected and or locked in some way. The PLC program submittal shall include all PLC and software disaster recovery procedures, including software applications.
- **Network Configuration**: A copy of all network configuration files shall be submitted in its native format. This shall include any redundant networks that may exist.
- **VFD Configuration**: A copy of the configuration of each VFD (including any firmware information) in the CBIS shall be submitted in its native format. The configuration submittal shall include all parameters including unchanged or default settings.
- **Communication and Other Controllers**: A copy of the configuration and code for all other devices as a part of the control system shall be submitted in its native format. An example of these devices might be co-processors or multi-vendor interfaces.
- **Firmware Configuration**: A spreadsheet listing all control devices and their associated firmware levels, where firmware is used, shall be submitted. This spreadsheet shall be submitted as both a Microsoft Excel document and as a PDF file. All devices which have firmware shall be included. Examples of these devices are PLC chassis, PLCs, I/O modules, Network modules, Communication modules and VFDs.

10.3.5 HMI Configuration: A copy of all HMI configurations shall be submitted in their native format. Soft copies of these programs shall also be provided, including any portion that is required to operate the system.

10.3.6 High-level Computer Configuration: A descriptive narrative of the high-level computer equipment of the CBIS shall be submitted in Microsoft Word and PDF format. Included in the narrative shall be a description of each computer and the function/task of the computer. Any data exchange between any computers or PLCs that control or affects bag decisions shall be included. In addition, the narrative shall describe the results of any computer failure and the ability of the CBIS to continue screening baggage.

10.3.7 Programming and Configuration Software: A spreadsheet listing all programming and configuration software with the revision level used shall be submitted. This spreadsheet shall be submitted as both a Microsoft Excel document and as a PDF file.

10.3.8 CBIS/ISAT Benchmark Data: A descriptive summary narrative of the system status at time of submittal shall be included in Microsoft Word and PDF format. This summary shall include, at a minimum, the following information:

- Scan time for each PLC, average and maximum
- Memory utilization for each PLC
- Network utilization for each network, high and low level networks. Where deterministic networks with set update times are used provide all settings and times.

10.3.9 Change Summary Log: A log of all changes made to the CBIS post-ISAT shall be maintained. The log shall be an itemized list of all the implemented and pending changes to date. This log shall be included in all submittals after its creation. The log shall include the following data at a minimum:

- CBIS designation
- Name of Change

- Description of change
- Status of change (i.e., in testing, operational, pending, etc.)
- Date of TSA approval
- Date of live operational use

CHAPTER 11: LIFE CYCLE COST ESTIMATING REQUIREMENTS

11.2 Life Cycle Cost Estimating Overview: To establish the lowest-cost alternative, planners shall calculate the life cycle costs of developing, maintaining, and replacing the CBIS.

11.3.1 Life Cycle Cost Analysis Period: To provide a standardized period for assessing life cycle costs, a 20-year total timeframe shall be assumed based on an EBSP Acquisition Decision Memorandum to fully capture the upfront capital costs, as well as recurring costs for staffing, O&M, and life cycle replacements.

11.3.4 Real Dollar Cost: Real values are used to provide a consistent comparison of costs over time and shall be used to estimate all costs considered in the life cycle analysis.

11.4.5 Required Building and BHS Infrastructure Modification Costs: Planners shall develop a detailed, bottom-up cost estimate for facility modification and infrastructure costs for all alternatives being considered.

11.3.5 Required Building and BHS Infrastructure Modification Costs: Facility modification costs shall be adjusted to account for regional differences in construction costs based on the latest *RS Means Construction Cost Data Indexes* published by Reed Construction Data or by other industry-standard cost adjustment practices.

11.6.3 Incremental BHS Maintenance Costs: For the purposes of the life cycle cost analysis of screening alternatives, planners shall only consider the incremental cost of BHS maintenance which is calculated by subtracting the existing maintenance cost of the current BHS (with or without a CBIS) from the total estimated maintenance cost of the new BHS with the proposed CBIS.

11.6.3 Incremental BHS Maintenance Costs: The overall annual cost of O&M for the full CBIS shall be estimated at 10% of the initial overall cost of the system.

11.6.4 Incremental BHS Operating Costs: Planners shall compare utility costs for the BHS on an incremental basis. To calculate the incremental BHS operating costs, planners shall subtract the existing operating cost of the current BHS (with or without a CBIS) from the total estimated operating cost of the new BHS with the proposed CBIS.

11.7.1 TSA Personnel Costs: Planners shall request staffing cost estimates for the screening alternatives under consideration upon submittal of the Preliminary Alternatives Analysis Report.

11.7.2 Incremental Costs for Baggage Porters and Other Airport/Airline Staff: Any increase or decrease in costs for baggage porters or other airport/airline staff shall be included in the life cycle cost analysis. Planners shall include only incremental costs for baggage porters or other airport/airline staff.

11.8 Basis of Estimate Document: Estimates submitted for funding request purposes shall include a BOE document which includes, at a minimum, the following elements:

- Purpose
- Executive summary
- Project scope description
- Methodology used to prepare the estimate
  - Work breakdown structure
  - Tools and data sources
  - Major cost components: labor, equipment, and material
  - Subcontractor and prime contractor markups and fees
  - Allowances
  - Other factors
  - Schedule requirements
  - Assumptions, exclusions, and exemptions
  - Areas of risks

11.8.2 Executive Summary: The Executive Summary shall provide a brief (no more than one page) overview of the project for which the independent cost estimate, cost estimate validation, or cost to complete report is being prepared. The Executive Summary section shall include, not necessarily in this order, discussions of:

- Where the project sponsor is in the bid and construction contract award process, if applicable
- Whether construction has already begun and, if so, how much of the construction has been completed, if applicable
- If the airport sponsor has awarded the construction contract, the type of construction contract instrument (firm fixed price, time and materials, design-build, etc.), if applicable
- Name of the general contractor and BHS contractor, if available
- Name and telephone number of the airport representative that provided the cost information
- Brief statement of the design level the estimate was based on and statement as to whether the CWE is authored by a single entity or is a reconciliation of two or more estimates
- Statement of the escalation that has been used, based on a project schedule and a summary of the CWE at a high level to show BHS costs, other construction-related costs, and soft costs
- Discussion of any known areas of risk
- Total estimated cost
- Statement regarding whether the airport sponsor's estimate is reflective of current market conditions. This statement should address:
  - Description of current bidding climate relative to number of bidders responding to requests for proposals
  - Use of Davis Bacon Act wage rates, where applicable
  - List of current construction projects, including project name, type, approximate construction value, and schedule
  - Use of union versus nonunion labor
  - Narrative of labor availability

  - Narrative of material and equipment availability
  - Review of typical contracting methods used in location
- Statement of the currency (i.e., age) of the airport sponsor estimates.

11.8.4.1 Work Breakdown Structure: A generic description of the estimate format and relationships of detailed cost items to their hierarchy shall be presented.

11.8.4.2 Tools and Data Sources: The BOE shall indicate the primary estimating methodology used in preparing the cost estimate, including that used for cost resources, historical data, and estimating tools and documents.

11.8.4.3 Major Cost Components: Labor, Equipment, Material: Sources for labor, equipment and material cost elements used in preparing the estimate shall be described, thereby further demonstrating the estimator's level of effort and knowledge of the project requirements.

11.8.4.5 Allowances: Allowances used in the estimate and the reason they were used shall be clearly stated.

11.8.4.8 Assumptions, Exclusions, and Exemptions: The BOE shall include three separate and distinct bulleted listings that concisely identify the assumptions, exclusions, and exemptions used in developing the estimate.

11.9 Current Working Estimate Submission: A summary of the Basis of Estimate costs shall be submitted at each phase of design.

11.9 Currect Working Estimate Submission: Airport sponsors requesting funding support from TSA shall provide a detailed breakout of allocable versus non-allocable costs at each phase of design.

11.9.2 Cost Estimate Pricing Substantiation: All CWE pricing shall be effective as of the date of the submittal.

11.9.2 Cost Estimate Pricing Substantiation: Estimates submitted for funding request purposes shall be accompanied by a market analysis specific to the airport location and timeframe during which proposed improvements will be implemented.

11.9.3 Allocable Costs: The Project Sponsor shall include both allowable/allocable and non-allowable/allocable costs in the appropriate CWE column.

11.11 Estimate Trending: Any changes to scope or design shall be identified, documented, and submitted to the TSA Project Coordinator for approval.

CHAPTER 12: CBIS DESIGN REQUIREMENTS

12.3 BHS Capacity: For new systems, no component of the CBIS shall constrain the maximum qualified capacity of each EDS unit. For recapitalization projects, the existing capacity of the CBIS shall not be reduced.

12.3 BHS Capacity: Legacy baggage handling systems shall not affect the performance of the CBIS.

12.3 BHS Capacity: The Project Sponsor shall ensure compliance with the EDS OEM's site planning and installation guidelines.

12.3.1 Mainline Requirements: Mainlines shall be capable of delivering bags to the EDS units to equal the capacity of the total non-redundant EDS units. Prior to entering the STZ, the BHS shall regulate baggage flow to not exceed the capacity of the non-redundant EDS machines. Mainlines taking bags away from the EDS unit shall be capable of transporting bags equal to or greater than the capacity of the non-redundant EDS units.

12.3.2 Tail-to-Head Bag Spacing Requirements: For slider bed conveyors, the space between bags as measured from the trailing edge of leading bag to the leading edge of the trailing bag, or "tail-to-head spacing" shall be no less than 12 inches prior to entering the EDS unit.

- Bag Spacing shall be measured on the queue conveyor immediately upstream of the EDS machine and shall be adjustable.
- Adjustments to bag spacing shall be done via the main BHS Operator interface (HMI) in the BHS control room. Adjustment is not allowed on remote HMIs.
- BHS Bag Spacing reporting shall:
  - Maintain spacing data for last 100 bags
  - Omit spacing greater than 36 inches when creating averages
  - Maintain a column in the "Bag Spacing Report" that shows bag spacing/averages
  - Trigger an event record when spacing is changed that will include time,date of change, and new spacing setting

12.3.2 Tail-to-Head Bag Spacing Requirements: The speed of the queue belt immediately before and after the EDS unit (as bags transition into and out of the EDS) shall comply with the EDS Integration manual. For ICS, the space between carriers shall be as determined by the EDS manufacturer and their ability to clearly delineate between carriers.

12.4 Screening Throughput Capacity Requirement: The actual screening throughput capacity of the CBIS as tested in accordance with the information presented in Appendix D shall meet or exceed the EDS throughput rate listed in the 100% approved BDR. If the average bag length used in the BDR differs from the average bag length of the ISAT test bag set, the tested throughput capacity will be adjusted from the BDR rate to be based on the ISAT test bag set average length. If this rate is greater than the maximum screening capacity of CBRA, the tested capacity of the CBIS shall not exceed the CBRA capacity.

12.6.1 Bag Travel Time Requirements, In-Line Systems: For in-line systems, the CBIS shall allow a minimum of 45 seconds of BTT without holding bags.

12.6.2 Bag Travel Time Requirements, Mini In-Line Systems: For mini in-line systems, the minimum BTT shall be 60 seconds.

12.6.2 Bag Travel Time Requirements, Mini In-Line Systems: For mini in-line systems, the minimum design OVT shall be 25 seconds for each alarm bag, for up to 3 consecutives alarm bags.

12.7.1 CBIS Positive Bag Tracking Requirements: The CBIS shall be capable of maintaining positive bag tracking in the STZ during events (e.g., diebacks, merging, decision point transitions, etc.) that are typical of situations which may occur in baggage handling systems.

12.7.1.1 Pre-EDS Requirements: The BHS shall assign a unique tracking ID (BHS Pseudo ID) to each bag once the bag enters the STZ within the CBIS for the purposes of positive bag tracking.

12.7.1.1 Pre-EDS Requirements: The CBIS shall incorporate an ATR upstream of the EDS matrix. ATRs shall not be located on an incline or decline. ATRs shall be a minimum of 6' away from a power turn.

12.7.1.1 Pre-EDS Requirements: ATR read rates shall be no less than 98% for laser arrays and 99% for RFID applications for valid reads for that system during controlled testing.

12.7.1.1 Pre-EDS Requirements: All systems utilizing an ATR shall maintain a relation between the BHS tracking ID and the 10-digit IATA bag tag ID for all bags that are successfully read.

12.7.1.1 Pre-EDS Requirements: The BHS Pseudo ID shall be used as the Primary ID passed from the BHS to the EDS. In all systems where an ATR is present, the 10-digit IATA bag tag data shall also be passed from the BHS to the EDS.

12.7.1.1 Pre-EDS Requirements: CBIS tracking shall in no way be controlled or constrained by a sort controller where the relation is maintained within the PLC.

12.7.1.1 Pre-EDS Requirements: The BHS Pseudo ID and, if available, the 10-digit IATA bag tag data shall be transferred between BHS and EDS equipment as defined by each EDS manufacturer's interface requirements document or integration guide. If the EDS does not accept both a BHS Pseudo ID and a 10-digit IATA bag tag ID, then the 10-digit IATA bag tag ID shall be transferred to the EDS as the primary tracking ID.

12.7.1.1 Pre-EDS Requirements: The upstream IATA tracking accuracy shall be calculated and reported in the CBIS Executive Summary Report, Figure A.4 1 by summing the quantity of the 10-digit IATA bag tags that are successfully handed off to the EDS units, R_{EDS}, with the quantity of 10-digit IATA bag tags that are seen by the photo eye just past the OOG divert location, $R_{OOG\,@\,PE}$, all divided by the quantity of 10-digit IATA bag tags that are successfully read by the ATR and supplied to the BHS, R. This value shall be displayed as a percentage and shall be at least 97%.

12.7.1.1 Pre-EDS Requirements: The IATA Handoff Accuracy shall be calculated by dividing the total number of 10 digit IATA bag tags sent back at the exit of the EDS machine by the total EDS volume. This measurement shall be displayed in the CBIS Performance report.

12.7.1.1 Pre-EDS Requirements: The BHS OEM shall ensure EDS Bag ID overlap does not occur between any EDS unit within any matrix.

12.7.1.1 Pre-EDS Requirements: BHS Pseudo IDs and EDS Pseudo IDs shall not overlap with IATA requirements for bag tag IDs or repeat themselves within 24 hours (i.e., unique BHS/EDS IDs are required for a duration of 24 hours).

12.7.1.1 Pre-EDS Requirements: The OOG tracking accuracy (absolute) shall be calculated by dividing the quantity of successfully tracked OOG bags just after the OOG divert location by the total OOG bags detected at the BMA. This value shall be displayed as a percentage in the CBIS Executive Summary Report and shall be at least 97%.

12.7.1.1 Pre-EDS Requirements: The Invalid OOG Arrival percentage shall be measured just after the OOG divert location and calculated by subtracting the known OOG bags, R_{OOG} @ PE + RNR, OOG @ PE, from the total quantity of bags at the same location, all divided by the total quantity of bags at the same location. This value shall be displayed as a percentage in the Daily CBIS Summary Report.

12.7.1.2 Post-EDS Requirements: When the EDS passes a decision to the BHS, the BHS shall retain this status throughout the tracking process for each bag and never override the EDS decision.

12.7.1.2 Post-EDS Requirements: If a decision is not received from the EDS, the BHS shall assign a Communication Error status for tracking purposes.

12.7.1.2 Post-EDS Requirements: At no time shall the system swap or transfer BHS tracking IDs on or between bags, nor swap or transfer security screening decisions on or between bags.

12.7.1.2 Post-EDS Requirements: Invalid arrivals at CBRA shall be monitored and logged via the BHS reporting system.

12.7.1.2 Post-EDS Requirements: During controlled testing, EDS Error and Timeout arrivals are excluded from the CBRA Arrival Rate calculation. During live operations, EDS Error and Timeout arrivals are included in the Invalid CBRA Arrival Rate calculation and shall be separately tracked, as any of these arrivals represent a system deficiency.

12.7.1.2 Post-EDS Requirements: The Invalid CBRA Arrival rate allowed for controlled testing and live operations shall not exceed 3% in a CBRA designed with a Baggage Reinsertion Line, and not exceed 2% in a CBRA designed without a Reinsertion Line.

12.7.1.2 Post-EDS Requirements: In the event of a BHS or EDS emergency stop (e-stop) activation, the system shall:

- Maintain tracking of all bags screened by the EDS and
- Maintain the security status of all bags that have been screened by the EDS and
- Maintain the security decision transmitted from the EDS to the BHS prior to or after activation of either a BHS or EDS e stop.

12.7.1.2 Post-EDS Requirements: The EDS shall recover from the e-stop condition in accordance with published criteria from the EDS vendor and the BHS shall recover per established e-stop recovery procedures defined in the BHS specifications and in accordance with the OEM's integration guidelines.

12.7.1.3 CBIS Detection Requirements: The CBIS shall be capable of detecting when any bag infringes on the tracking window of any other bag as long as the bags are at or above the minimum conveyance size and the bag is not on top of, underneath, or directly beside another bag.

12.7.1.3 CBIS Detection Requirements: The CBIS shall be capable of detecting when a bag has been delayed or accelerated in accordance with Appendix D, Section D.3.2 and D.3.3. Delaying or accelerating a bag beyond the configured tracking tolerance shall result in application of one of the following solutions:

- Upstream of EDS (single bag): The CBIS shall reacquire the bag and continue tracking.
- Downstream of EDS (single bag): If the bag has already been screened and traveled 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.
- Downstream of EDS (multiple bags): If multiple bags are involved and tracking windows have been infringed upon, then the CBIS shall be capable of detecting this condition and route all bags involved to the CBRA.

12.7.1.3 CBIS Detection Requirements: The CBIS shall be capable of detecting when a bag has been added within the tracking zone as long as that bag is added anywhere other than on top of, underneath, or directly beside another bag.

- Upstream of EDS (single bag): The CBIS shall acquire the bag and continue tracking.
- Downstream of EDS (single bag): 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.

12.7.3 Bag Length: Bag length shall be measured at a photo eye no more than two queue conveyors upstream of the EDS unit. This measurement shall be established as the bag's baseline length. The use of a dual belt speed conveyor shall not negatively affect this measurement in any way.

12.7.3 Bag Length: Bag length shall be re-measured upstream of the diverter and the measurement shall be compared to the bag's baseline length. Any bag that has increased in length by 12 inches or more upstream of the diverter shall be conveyed to the CBRA with a status of "Length Change".

12.8.1 CBIS Conveyor Subsystem Nomenclature: The following nomenclatures shall be used by CBIS designers:

- Mainline Feeds: SF (Security Feed)
- Shunt: SS (Security Shunt)
- Out-of-Gauge: OOG
- OSR Line: OSR
- Clear Line: CL
- Alarm Line: AL
- Re-Insert Line: RL
- Oversize: OS
- Crossovers: XO

12.8.3 Divert and Merge Requirements: Bags exiting the EDS machine shall be properly spaced via increases in belt speeds on subsequent conveyors to allow for continuous flow (no less than the minimum diverter processing rate) through the level 1 divert point.

12.8.3 Divert and Merge Requirements: Bags exiting each EDS unit shall be separated by their clear or non-clear screening status prior to merging onto the post-EDS mainline or OSR line. ICS carriers shall be separated by their clear or non-clear status at the first opportunity but may travel on the OSR line.

12.8.3 Divert and Merge Requirements: After clear and non-clear bags have been separated, they shall not be commingled.

12.8.3 Divert and Merge: Only clear bags shall be diverted at horizontal diverters; non-clear bags shall pass through. At vertical diverters, clear bags shall divert up and non-clear bags shall divert down.

12.8.1 CBIS Conveyor Subsystem Nomenclature: The following requirements apply to diverters in the security tracking zone downstream of the EDS units:

- For systems with two decision point diverters, at the first decision point diverter, if the system is unable to divert a clear bag, the bag shall bypass the diverter on the Alarm Line.
- For systems with two decision point diverters, at the second chance diverter, if the system is unable to divert a clear bag, the bag shall cascade stop and NOT bypass the diverter on the Alarm Line.
- For systems with a single decision point diverter, if the system is unable to divert a clear bag, the bag shall cascade stop and NOT bypass the diverter on the Alarm Line.

- The CBIS bypass feature shall be enabled and disabled via an operator's workstation in the BHS control room. Bypass features that send non-clear bags to the outbound system shall not be allowed.

12.8.4 Baggage Allocation Methodology: BAM refers to the logic used to distribute bags between the EDS units. All new CBIS designs shall incorporate a round-robin BAM, in which bags are routed singularly and consecutively to each available SS line. Deviations from round-robin BAM shall be submitted through an RFV for review and approval by TSA.

12.8.5.3 Divert and Merge Requirements and Best Practices: Designers shall not utilize pre-EDS 90 Degree diverter-takeaway configurations on diverters feeding the security shunt lines.

12.8.5.4 Bag Orientation Requirements and Best Practices: Pre-EDS bag centering devices shall be used on the security shunt lines to optimize bag presentation to the EDS

12.8.6 Recirculation Loop Requirement: The automatic recirculation of bags shall not be designed, either pre-EDS screening or post-EDS screening, except for connected reinsertion lines in the CBRA.

12.8.7 Reinsertion Line Requirement: Non-cleared bags shall only be reinserted upstream of the STZ.

12.8.8 Draft Curtain Requirement: All PECs shall be clear of obstructions, including draft curtains.

12.8.9 Stack Light Requirements: Stack lights used at decision points in the CBIS shall adhere to the following color designations:

- Green = Cleared
- Red = Alarm
- Blue = Fail-safe
- White = All others (Unknown, EDS Errored, Pending, etc.)

12.8.12 Out-of-Gauge Bag Conveyance: The CBIS shall transport OOG bags directly to the CBRA. OOG bags shall be diverted upstream of the EDS lines. To minimize bags on the OOG line, bags that do not have dimension information or that may have been lost in tracking after the BMA shall be transported to an EDS shunt, not the OOG line. An over-height protective device shall be installed two queues in front of each EDS unit, e.g., an over-height photo eye, light curtain, headache bar or other similar device to ensure over height bags are stopped prior to the EDS unit.

12.9.1 Fail-Safe Operation General Requirements: In the event of a fail-safe activation, the default path for any non-clear bag shall be to a secure location. Non-clear bags shall never be sent to an airside location.

12.9.1 Fail-Safe Operation General Requirements: Fail-safe activations shall not exceed 0.5% of bag volume for each system test in controlled testing as measured by dividing the number of fail-safe activations at all Decision Diversion Points by Total Bags Inducted.

12.9.1 Fail-Safe Operation General Requirements: Fail-safe activations shall not exceed 0.5% of bag volume during the Daily Peak Hour and 24-Hour Calendar Day as measured by dividing the number of fail-safe activations at all Decision Points by Total Bags Inducted using the Daily CBIS Summary Report defined in Appendix A, Section A.4.

12.9.1 Fail-Safe Operation General Requirements: The sidewalls of all conveyors or portions of conveyors associated with the fail-safe zone shall be clearly marked or identified to support appropriate bag removal.

12.9.1 Fail-Safe Operation General Requirements: Fail-safe alarms shall be distinct from all other types of system event alarms.

12.9.2 Fail-Safe Operation Requirements for In-Line CBIS: Bags shall be tracked though each diverter downstream of the EDS units prior to the CBRA. A single bag failing to track from the decision photo eye upstream of the diverter to the fail-safe photo eye on the Alarm Line downstream of the diverter shall activate a fail-safe condition.

12.9.2 Fail-Safe Operation Requirements for In-Line CBIS: Upon activation of a fail-safe:

- The appropriate number of conveyors on the clear bag line, as calculated in Item 4 below, shall stop; and,
- Activate audible and visible fail-safe alarms in locationss designated by TSA.

12.9.2 Fail-Safe Operation Requirements for In-Line CBIS: The length of clear bag line conveyors to stop shall be calculated as follows:

1. Measure the amount of time (T) for a bag to travel from the tracking/decision point photo eye before the diverter to the fail-safe photo eye after the diverter.
2. Calculate the distance (D) a bag travels on the clear line in the time established in step #1 above (T), and then add five additional feet. This distance (D+5) is the portion of the Clear Line identified as the fail-safe zone.
3. All conveyors in the fail-safe zone must be stopped during a fail-safe event.
4. To account for unique project requirements, additional conveyors may be identified and stopped as a part of the fail-safe zone. However, under no circumstances shall fewer conveyors be identified and stopped as the fail-safe zone.

12.9.2 Fail-Safe Operation Requirements for In-Line CBIS: For systems with more than one diverter between the EDS units and the CBRA, during a fail-safe activation at the first chance diverter, clear bags shall pass the diverter on the Alarm Line to be diverted at the second chance diverter.

12.9.2 Fail-Safe Operation Requirements for In-Line CBIS: For systems with a single diverter, during a fail-safe activation at this diverter, clear bags shall not pass the diverter and shall cascade stop upstream of the diverter.

12.9.3 Fail-Safe Operation Requirements for a Manually Operated In-Line Decision Point CBIS: In case of a fail-safe event, the BHS shall identify non-clear bags and perform one of the following actions:

- Maintain a halt condition on the Clear Line beyond the manually operated in-line decision point except when a clear bag has been successfully transported through the in-line decision point (i.e., bag information for any non-clear bags has been cleared and a clear bag is either approaching the in-line point or a bag has been processed manually at the CBRA and is reinserted at the reinsertion point through the use of local BHS controls); and
- Activate audible and visible fail-safe alarms.

12.10 Operational Test Kit: Specific OTK Test controls shall be built into the CBIS in coordination with the EDS and BHS vendors and their integration documentation. The OTK testing controls shall be appropriately located to control the OTK Test with minimal walking between the controls, OTK load point and OTK unload point, and between adjacent units so that two units can be tested from one location. The conveyors between the OTK load and unload points shall be straight with a maximum angle of 0 degrees.

12.10 Operational Test Kit: These [OTK Test] controls shall enable an operator to:

- Stop the normal flow of bags into the EDS without losing track of bags already in the system.
- Allow the OTK bag to be placed safely and properly onto the EDS entrance conveyor or immediately adjacent conveyor. The sideguard height at this interface point shall not exceed 4 inches and have no protrusions or sharp edges. For safety purposes, the conveyor belt immediately upstream of the OTK load point shall stop when OTK Mode is activated to prevent a pinch point.
- Restart the EDS entrance conveyor to feed the OTK bag into the EDS.
- Stop the OTK bag on the EDS exit conveyor or immediately adjacent conveyor to allow removal of the IQT bag. The sideguard height at this removal point shall not exceed 4 inches and have no protrusions or shape edges.
- Allow for repeat of OTK Tests as necessary.
- Return the system to normal screening operation.

12.10 Operational Test Kit: All of the OTK processes shall be supported without requiring a shutdown and restart of the CBIS from a MCP or other location. The OTK control station shall consist of a keyless, selector type switch or HMI graphics to enable the OTK test mode. The OTK test activation signal shall be annunciated in the BHS control room.

12.11 Bag Jam Rate: The Jam Rate shall be less than 1%.

12.11 Bag Jam Rate: During controlled testing, the bag jam rate for each system test shall be less than 1% of inducted bag volume is calculated by dividing the number of jam events (hard and missing) from the ATRs of the SF line through all EDS shunts to the entrance of the EDS by the total bags inducted during the test.

12.11 Bag Jam Rate: During live bag operations, the bag jam rate shall be less than 1% of bag volume during the Daily Peak Hour and 24-hour Calendar Day as measured using the Daily CBIS Summary Report defined in Appendix A, Section A.4.

12.12.1 Service Access: A minimum service area shall be provided of 3 feet around all four sides of the equipment and 3 feet vertical clearance above the highest point of the EDS.

12.12.2 Environment: The Project Sponsor shall ensure that all operating environmental and maintenance requirements as set in the OEM's integration guidelines are met.

12.12.2 Environment: Designers shall not use wet-type fire protection sprinkler systems above or in close proximity to the EDS machines.

12.12.2 Environment: Designers shall use the EDS PGDS Maintainability Standards Exhibit (Environment Checklist) displayed in Figure 12 5 to ensure that the required environmental standards described in this section are met.

12.12.3 Storage and Spare Parts Access: Secure storage space shall be provided close to the EDS units for spare parts and tools.

12.12.4 EDS Replacement: The Project Sponsor shall include access routes for EDS equipment replacement in the CBIS design.

12.12.5 Quick Disconnect Standard: CBIS designers shall identify the appropriate number of conveyor components in the Detailed Design phase immediately before and after the EDS unit that will be readily removable using commonly available hand or power tools. Designers shall also identify the methodology for removal of any ancillary equipment before or after the EDS units to allow for easy access to the EDS units for maintenance, removal or replacement.

12.12.6 EDS UPS and Power Requirements: The Project Sponsor shall provide power to the EDS machines that complies with the requirements in the most current OEM installation and integration manual at the time of design. A Power System Engineering Analysis shall be conducted during the construction phase to demonstrate that power requirements are met. The analysis shall include:

- Visitation of the facility during normal working hours for the purpose of performing power quality monitoring of specified equipment during routine operations
- Collection of information relevant to power system engineering analysis as it relates to the utility source (i.e., airport mains power)
- Recording of data for the duration of 30 calendar days, as measured on a Line Voltage basis (i.e., Line-to-Line, 480 volts nominal), to capture data elements that include, at minimum:
  - Key Evaluation Parameters
    - PF: Power Factor
    - Steady State Voltage (Line to Neutral)
    - Voltage Unbalance
    - VTHD: Voltage Total Harmonic Distortion
    - TDD: Total Demand DistortionMax Circuit Loading
    - Voltage Distortion Events
  - Voltage Transients
    - Voltage Sags
    - Voltage Swells
    - Voltage Interruptions
  - Voltage Tolerance Curve Results
    - (e.g., Information Technology Industrial Curve – ITIC)

The Project Sponsor shall issue a written compliance report within 20 calendar days of the end of the data collection that presents the findings of the power system engineering analysis and any recommendations for remediation of documented utility source problems

1212.7: EDS Network: EDS PLC shall communicate to the BHS PLC via Ethernet/IP Protocol.

12.13.1 Reporting Frequency Requirement: The CBIS reporting system shall be capable of providing data in real time (±1 minute) and in hourly, daily, weekly, monthly, quarterly, annual, and manually entered time periods.

12.13.2 Reporting Detail Requirements: The CBIS reporting system shall be capable of providing detailed data by Bag ID number and EDS unit and will be provided by the BHS Vendor.

12.13.2 Reporting Detail Requirements: At a minimum, the reporting system shall be capable of providing the following features in reports:

- Bag Data
  - Bag Tag number (with ATR/RFID installed)
  - Time stamped at BMA
  - BHS tracking ID number for each bag (shared by BHS and EDS unit)

- Bag type (OS, OOG, in-gauge)
- Time stamped when bag enters the EDS unit or time stamped when OOG bags are diverted to OOG Line
- SSI - Level 1 screening status
- SSI - Level 2 screening status

12.13.2 Reporting Detail Requirements: At a minimum, the reporting system shall be capable of providing the following features in reports:

- Critical Tracking PEC: Immediately upstream and downstream of each EDS, prior to and after each tracked divert point, and at the last tracked PEC entering the CBRA, the BHS shall report the following for each activation of the PEC:
  - Bag ID
  - SSI - Bag screening status

12.13.2 Reporting Detail Requirements: At a minimum, the reporting system shall be capable of providing the following features in reports:

- BHS Faults
  - Fault type (NOTE: A "fault" is defined as a “cause” such as lost in track, motor overload, PEC failure, encoder failure)
  - Fault location
  - Fault time
  - Fault time cleared
  - Total fault time

12.13.2 Reporting Detail Requirements: At a minimum, the reporting system shall be capable of providing the following features in reports:

- BHS Events
  - Event type (NOTE: An "event" is defined as the “effect” of a fault, such as re-establish tracking, fail-safe, or jams, or the “effect” of human interaction on the system, such as via HMI or control station, e.g., pushing an e stop or OTK activation)
  - Event location
  - Event time
  - Total event time

12.13.2 Reporting Detail Requirements: At a minimum, the reporting system shall be capable of providing the following features in reports:

- EDS Statistics (if data to support these statistics is available from the EDS OEM being installed)
  - SSI – Number of bags alarmed by specific EDS unit
  - SSI – Number of bags cleared by specific EDS unit
  - EDS unit faults (if known)
  - Start time of fault
  - End time of fault

12.13.2 Reporting Detail Requirements: At a minimum, the reporting system shall be capable of providing the following features in reports:

- ATR Performance
  - ATR Name
  - ATR Description (i.e., Tracking or Sortation)

- Total number of bags seen
- Total number of tags read
- Number of problem tag reads (this can be provided as a single total count or ideally as a set of constituent counts plus a total count and should be representative of the number of unreadable/missing tags, number of invalid tag reads, number of conflict/multi-tag reads, etc.)
- Number of associated tag reads (i.e., the number of 10-digit IATA bag tag IDs read and associated with the bag's BHS tracking ID)
- Total number of 10-digit IATA bag tags that are read at the ATR and passed to the EDS
- Total number of 10-digit IATA bag tags sent back at the EDS exit
- Upstream IATA Tracking Accuracy
- IATA Handoff Accuracy

12.13.2 Reporting Detail Requirements: At a minimum, the reporting system shall be capable of providing the following features in reports:

- BMA Statistics
  - Total number of bags through the BMA
  - Total number of OS bags
  - Total number of OOG bags
  - OOG (absolute) tracking accuracy

12.13.2 Reporting Detail Requirements: At a minimum, the reporting system shall be capable of providing the following features in reports:

- System Baggage Volumes
  - By input conveyors (ticket counter conveyors, curbside conveyors, oversize conveyors)
  - By screening area (including EDS unit and CBRA)

12.13.2 Reporting Detail Requirements: At a minimum, the reporting system shall be capable of providing the following features in reports:

- CBRA Statistics – CBRA statistics shall be presented and considered SSI.
  - Cleared
    - Cleared (CLR)
    - PRE-Clear (P-CLR)
    - SEL-Clear (S-CLR)
  - Alarmed
    - Alarmed (ALM)
    - PRE-Alarmed (P-ALM)
    - SEL-Alarmed (S-ALM)
    - No Decision
    - Purged
    - Queue Time Out (Q-TimeOut)
    - Operator Time Out (O-TimeOut)

- Lost in Tracking
  - Mistracked
  - Bag Length Tracking
  - Following Lost Bag
  - Too Close
  - Security Re-route
- Unscreened
  - OS
  - OOG
  - OOG (absolute) Tracking Accuracy
- Reinsert Line
  - Reinserted bags

12.13.2 Reporting Detail Requirements: At a minimum, the reporting system shall be capable of providing the following features in reports:

- PEC Tracking Statistics
  - Total number of bags seen at each PEC
  - Total number of purged bags at each PEC
  - Total number of missing bags at each PEC
  - Total number of unknown bags at each PEC
  - Total number of "hard" jams at each PEC
  - Total number of missing bag jams at each PEC

12.13.2 Reporting Detail Requirements: At a minimum, the reporting system shall be capable of providing the following features in reports:

- BPT Statistics – see Section 14.5.5
  - Total number of bags seen
  - Average processing time for each bag
  - By BIS position

12.13.2 Reporting Detail Requirements: The reporting system shall provide BHS Reports which should be within 5% difference or accuracy compared to the EDS Counts per screening line.

12.13.2 Reporting Detail Requirements: For MITs and ICS systems, all CBRA reports shall be generated based on bag status upon arrival at the inspection station location.

12.13.3 Daily Reporting Requirements: At a minimum, the following daily reports in the format shown in Appendix A, Section A.4 shall be available to the local TSA representative via auto-download and auto-transmittal capabilities to a specified existing email address or secure storage location:

- Daily CBIS Summary Report
- Daily CBIS Summary Report – Peak Hour

- Daily CBIS Bag Volume Report
- CBIS Executive Summary Report (Figure A.4 3) – SSI
- CBRA Executive Summary Report (Figure A.4 4) – SSI
- PEC Tracking Reports for all PECs within a tracking zone
- BPT Summary Report
- CBRA Bag Report
- CBIS Hourly Throughput Report – SSI
- CBIS Bag Spacing Report
- CBIS Performance Report– SSI

12.13.4 BHS ID Log Report Requirements: A report of the last 1000 BHS IDs shall be provided as defined below:

- The BHS_ID_LOG shall be considered a FIFO. The FIFO shall capture the last 1,000 Pseudo IDs, associated decisions and a flag indicating whether the bag has been processed by a TSO (including re-inserted for screening) for each EDS.
- This data shall consist of three elements:
  - Pseudo_ID
  - Decision
  - Processed
- The report shall be provided in both a PDF format and an importable CSV file.

12.13.5 BHS Reporting During Maintenance: BHS Reporting capabilities shall be designed such that logging of photo eye activity (i.e., total, missing, unknown, etc.) is disabled on conveyors not running or operating in a manual override mode. The BHS shall only log PE activity when conveyors are running in a fully automated mode.

CHAPTER 13: ON-SCREEN RESOLUTION AREA PLANNING STANDARDS REQUIREMENTS

13.1 OSR Overview: National Fire Protection Association (NFPA) 70, National Electrical Code and NFPA 101, Life Safety Code or similar standards adopted by the authority having jurisdiction, shall be used, as appropriate, in the design of OSRAs.

13.3.2 Entrances and Exits: Door widths and access to space shall comply with applicable building codes and the American with Disabilities Act.

13.3.5 Plan Space Provision: For space allocation purposes, the size of the OSRA shall be based on the number of OSR stations derived based on the DBU+15 checked baggage demand projections and respective EDS requirements

13.3.6 Vertical Space Provision: Wheelchair access shall be provided by ramps, which require additional floor space, or wheelchair lifts.

13.3.6 Vertical Space Provision: Where changes of floor level are introduced in conjunction with entrances or exits, proper physical aids such as guardrails, handrails, anti-slip surfaces, and appropriate signage, when indicated, shall be provided to minimize potential workplace hazards.

13.3.7 Windows: The ratio of luminances for task areas that are frequently viewed in sequence (for example, screen, document and windows) shall be lower than 10:1 as referenced in Mil-STD-1472G 5.2.1.3.8.

13.3.7 Windows: Displays shall be free from glare.

13.3.7 Windows: When windows are included in OSRAs, the following shall be taken into account:

- Workstations shall not be facing windows.
- Windows shall not be located behind the OSR monitors.
- Windows located on the left or right side of a workstation shall have a minimum distance of 9 feet to that workstation.
- Windows shall be included in meeting and relaxation areas and offer an alternative visual environment to that of the OSRA.

13.3.8 OSR Noise Abatement: The OSRA shall be provided in an environment that minimizes noise as much as possible. Because of the likely proximity to the BHS bag room, the walls and ceiling of the CBRA require adequate acoustical insulation so that the background noise levels shall not exceed 65 dBA as measured at the natural TSO sitting points at each screening station using a time-weighted average over an 8-hour shift.

13.3.9 Heating, Ventilation, and Air Conditioning: The OSRA shall be a climate-controlled space. Temperature and humidity control shall be supplied commensurate with the locale. A separate temperature control thermostat shall be provided for the OSRA.

13.3.9 Heating, Ventilation, and Air Conditioning: If forced-air ventilation is provided, fresh outside air shall be delivered to the OSRA at rates specified by the American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE) Standard 62.1-2016 Ventilation for Acceptable Indoor Air Quality. The OSRA shall be under positive pressure relative to ambient BHS areas to minimize the migration of contaminants (e.g., products of combustion from tugs and vehicles, as well as outside dirt, dust, and debris) from entering into the OSRA.

13.4.3 OSR Room Layout: OSR Rooms shall include:

- Workstations
- Supervisor/CI workstations
- Separation between the OSR room and the BHS control room; the two cannot be one in the same
- A BHS monitor screen in the OSR room that only shows the CBIS area as related to TSA operations
- A centralized location for remote stop/start devices in order to minimize delays in re-setting EDS in faulted conditions (NOTE: Not available with L-3 equipment)
- A direct line of communication from the airport operator to the OSR room and to the CBRA as well as a direct line of communication between the OSRA and CBRA with a visual indicator in addition to an audio indicator
- The lighting in the area shall include dimmers to allow for better screen viewing
- Equipment racks
- Storage both on and off the workstation
- Notice board
- Where counters are used for the receipt or collection of documents, these often need to be near entrances or easily accessible from certain operating positions and should accommodate organizational bins and file cabinets
- Clear Line of sight to enable supervision of the entrances/exit points
- Access to electrical panel boxes (including disconnecting means)
- Access to first aid equipment, emergency equipment and emergency exits

- Primary workstations shall be shielded from windows present in non-operational areas of the OSR room
- Shared off-workstation displays
- Desks
- Printer stands, photocopying machines and other office equipment, as necessary.

13.4.3 OSR Room Layout: A secondary passive CBIS display shall be added to provide real-time performance metrics identical to that required in Section 14.3.3. The display shall be installed on the supervisor's desk. The exact location shall be coordinated between TSA and the ILDT during the project submittal phase.

13.4.4 Workstation Arrangements and Ergonomic Considerations: Where confidential information is presented on display monitors, it shall not be possible to see this information from the public viewing areas.

13.4.4.1 Floor Plan Arrangements: Workstation arrangements shall take into account operations under normal and abnormal modes of system operation. For example, fallback arrangements for information transmission by paper or other non-electronic means.

13.4.4.1 Floor Plan Arrangements: Luminance shall be measured at the center of the monitor, and found to be in the range of 300 to 500 lux.

13.4.4.2 Control Workstations: A Supervisor/CI workstation shall include communications infrastructure for telephone and TSA network access.

13.4.4.4 Specific Ergonomic Considerations: Monitors

- Height: top of monitor shall be at or slightly below eye level
- Size: 20-23-in. monitor shall be sufficient
- Distance: shall be 20-40-in. from the eye to the front surface of the monitor
- Position: shall be directly in front of you, so your head, neck and torso face forward when viewing the screen. Monitors should not be farther than 35 degrees to the left or right
- Glare: shall be positioned away from windows

13.4.4.4 Specific Ergonomic Considerations: Desks

- Height: shall be adjustable between 20-in. and 28-in.
- Clearance: shall be 15-in. for knees and 24-in. for feet, width at least 20-in.
- Glare: desktops shall have a matte finish, avoid glass tops

13.4.4.4 Specific Ergonomic Considerations: Chairs

- Height: shall be fully adjustable with a minimum range of 16-in.
- Backrest: shall be at least 15 in. high and 12-in. wide, and should recline 15 degrees from vertical
- Seat Size: seat pan length shall be 15-in. to 17-in. and depth adjustable
- Chair Base and Rotation: shall be 5-legged base; 360 degrees unrestricted rotation
- Armrests: shall be removable, distance between them shall be at least 16-in. and adjustable

13.4.5 Off-Workstation Shared Visual Displays: The layout of the OSRA shall ensure that all off-workstation shared visual displays necessary for the TSO operator task are visible from all relevant workstations.

13.4.5.1 Horizontal and Vertical Viewing Distances: Necessary information presented on shared overview visual displays shall be visible by personnel, with applicable 5th to 95th percentile body dimensions of the TSO operator population, from their normal working positions.

13.4.5.1 Horizontal and Vertical Viewing Distances: Operational information presented on the lowest part of an off-workstation shared visual display shall be visible to a 5th percentile, seated, non-upright TSO operator.

13.4.5.1 Horizontal and Vertical Viewing Distances: He is the design-eye-position, measured from the floor to the outer corner of the eye; 5th percentile shall be applied

13.4.6 Personnel Circulation and Custodial Services Access: All aspects of OSRA layout shall take into account the requirements for maintenance and custodial services access as stated in Mil Standard 1472G Section 5.9.

13.4.7 Personnel Circulation: Planning for the circulation of personnel throughout the OSRA shall include the following:

- Adequate general circulation, such that OSRA operations are not interrupted by either visual or auditory distraction.
- Adequate circulation areas where shift changeover is protracted and two shifts are present in the OSRA at the same time.
- Orderly evacuation of the area via easily identifiable routes of egress in the event of an emergency, such as a fire alarm.
- OSRA circulation routes arranged to avoid cross-circulation.
- Restricted ceiling heights, where present, be indicated using ceiling-mounted warning.

13.4.8 Custodial Services Access: Inadvertent activation of any safety-critical controls shall not be possible during cleaning tasks.

13.5 Verification and Validation of OSRA Layout: In all cases, local, state, and Federal regulations regarding design and construction shall supersede the recommendations included in this section.

CHAPTER 14: CHECKED BAGGAGE RESOLUTION AREA PLANNING STANDARDS REQUIREMENTS

14.1 CBRA Overview: Deviations from Chapter 14 requirements shall be submitted through an RFV for review and approval by TSA.

14.2 CBRA Layout: The CBRA layout shall be designed to optimize TSO utilization, avoid bag lifting, and reduce equipment costs. The CBRA layout shall be centralized and incorporate the following:

- Multiple Alarm Lines may be used for larger CBRAs
- Connected to the end of the Alarm Line, a Reinsert Line with no side guard to ease bag placement during manual reinsertion
- Transport of OOG bags via the Alarm Line and leave via the Clear Line
- Transport of OS bags via a dedicated conveyor line

14.2 CBRA Layout: For smaller configurations, the optimal layout shall include a straight Alarm Line and a parallel Clear Line.

14.3 Baggage Inspection Stations: BIS designs shall include a flat work surface for the TSO to place the bag and remove any objects inside the bag as needed. The work surface shall be made of a non-porous material that can withstand isopropyl alcohol decontamination. The BIS work surface shall be 30” W x 60” L and be placed at 30” high above the finished floor.

14.3 Baggage Inspection Stations: The BIS design shall be capable of processing bags year-round in an environment with a temperature range of 50-100°F and a humidity of 30-70%. The baggage to be screened may weight up to 125lbs. The BIS shall provide a 36” W x 60” L workspace in front of the working surface for the TSO to move freely. In addition, the BIS shall allow maintenance access to all components and shall accommodate all the CBRA ancillary equipment listed in Section 14.3.1.

14.3 Baggage Inspection Stations: Kick panels shall be installed at all locations where a bag is opened along the Alarm Line and Clear Line.

14.3 Baggage Inspection Stations: The BIS shall provide a storage system for these tools to increase TSO efficiency, prevent theft, and avoid leaving tools inside passenger luggage after the inspection. The tool storage system shall be:

- Organized for easy inventory checks at the end of each shift by the TSM
- Visually trackable for quick inventory checks after each bag inspection by the TSO

The storage system shall allow quicker access to primary and secondary tools as these are the most used, while the special tools may require more time to obtain since they are only used occasionally.

14.3.1 BIS Ancillary Equipment: The BIS shall include all the supports needed to mount the ancillary equipment listed in this section.

14.3.1 BIS Ancillary Equipment: One BSD shall be installed per BIS. The BSD shall be color and touch capable with an 8” to 12” diagonal display size. The bezel of the BSD shall not exceed 1” in any direction and shall be located near the BRP at a 45-degree angle. The BSD mounting solution shall be adjustable in X, Y, Z dimensions without the use of tools.

14.3.1 BIS Ancillary Equipment: The SVS monitors, keyboard and mouse shall be located towards the middle of the BIS and shall be adjustable in X, Y, Z dimensions without the use of tools. The SVS CPU shall be located in a lockable compartment where it will not interfere with the screening process.

14.3.1 BIS Ancillary Equipment: The scan gun shall include a shock absorbing protector (i.e., rubber or similar) and be located near the adjacent BRP on a retractable reel. Scan guns shall be corded with stationary mounting solutions.

14.3.1 BIS Ancillary Equipment: The CBRA design shall provide means to place and share an ETD between two adjacent BISs.

14.3.1 BIS Ancillary Equipment: The Emergency Stop (E-stop) shall stop all conveyors in a contiguous line when pressed during an emergency. Each BIS shall have an accessible E-stop. A single start push button per E-stop zone shall be installed to ensure the system can only be started (reset) from one location within the zone after an E-stop has been activated.

14.3.1 BIS Ancillary Equipment: The BIS shall provide a place to locate the UPS.

14.3.2 Baggage Removal Point: The BRP shall be 48” L and 32” H (floor to the conveyor bed). The PE location and programing of the BRP shall ensure that arriving bags are centered (with respect to the width of the conveyor) and stop next to the corresponding BIS. In addition, the photo eye reflector cover shall be of a slim design no more than 1” H that allows bags to be slid over it.

14.3.2 Baggage Removal Point: The queue conveyors situated between the BRPs are termed "Intermediate Queues" and shall be a minimum of 48" L and 32" inches in height. Intermediate queues shall be installed in the space between BIS pairs adjacent to the circulation space for the TSOs.

14.3.3 CBRA BHS Displays: The CBRA shall be equipped with a display of additional BHS information that is useful for the TSA to effectively respond to system issues or bag surges. This information shall be visually available as follows:

- BHS Status Display – A visual representation of the conveyor belt design shall be included that uses industry-wide standard color codes to communicate real-time equipment status.
- BHS CBIS Remote Reporting Workstation – A remote thin client BHS workstation shall be provided to TSA in OSR/CBRA at supervisor's desk depending on system size and TSA needs.
- The BHS Remote Reporting Workstation display of all reports shall include an optional setting that refreshes the information on the display at a selected interval so that the report can be left open on the display and show current operational data.

14.3.3 CBRA BHS Displays: The exact configuration of CBRA BHS displays shall be coordinated between TSA and the ILDT during the project submittal phase.

14.4.1 BIS Utilization: BISs shall be enabled in upstream sequence only, beginning with the furthest downstream station. The BHS shall inhibit an upstream station from being enabled if downstream BISs are disabled.

14.4.1 BIS Utlization: When there is more than one available BIS, bags arriving on the Alarm Line shall be assigned to the BIS that has been available for the longest period of time.

14.4.2 Alarm Line Queuing: If there are no enabled BISs, bags arriving on the Alarm Line shall queue at the second most downstream BRP.

14.4.2 Alarm Line Queuing: The CBRA shall be programmed to queue bags waiting for an available BIS in the following order:

- Level 1: Enabled BRPs, starting from the most upstream
- Level 2: CBRA queue conveyors (except intermediate queues), upstream of the enabled BISs
- Level 3: Intermediate queues starting from the most upstream

14.4.3 Baggage Removal Point Lag Timer: After a bag has been removed from a BRP and an action button has been selected on the BSD (the chronological order is irrelevant, but both conditions must be met), the system controls shall have an adjustable lag timer for the BRP belt to resume operations (i.e., advance other bags). The default value shall be 3 seconds

14.4.4 Scan Guns: The scan guns shall be connected to the BSD so data is passed from the BHS to the SVS via a predefined communication port.

14.4.5: Baggage Process and Screening Timers: The BHS shall use a BPT to record every bag processing time at each BIS using the arrival of a bag at the BRP as the start signal for the timer. BPT information is considered SSI and requires SSI training to access. The BHS shall also use a Baggage Screening Timer (BST) to record the bag screening time at each BIS using the SEARCH button on the BSD as the start signal for the timer. Both BPT and BST use the CLEARED button for the stop signal and are recorded in the CBRA Bag Process report.

14.4.6: Reinsert Line: The Reinsert Line conveyor shall automatically start when a reinserted bag is detected on the upstream queue conveyor and the bag is automatically transferred onto the Reinsert Line for rescreening.

14.4.6 Reinsert Line: Bags eligible for either automatic or manual reinsertion shall be assigned a new unique BHS tracking ID prior to rescreening.

14.4.6:A control station shall be provided to operate the Reinsert Line conveyor and allow for the manual placement of a bag. At the manual reinsert points, located in optimal layouts shown in Figure 14.1, the design shall incorporate a control station with the functionality of "Insert Bag" which will stop the conveyor and queue bags upstream to allow a bag to be manually placed on the conveyor (manual reinsert process). After the bag is placed on the conveyor, pressing a "dispatch" button shall send the bag downstream tracked with a status of "REINSERTED". Reinserted bags shall not stop at enabled BRPs if the path to the Reinsert Line is clear and will be advanced directly to the Reinsert Line.

14.4.7 Serial Communication Requirements: Projects based on this version of the PGDS shall include provisions for these requirements to be incorporated during the project or as defined by the EDS Integration Documentation at the time of installation.

14.4.7.1 Communication Port Parameters: Projects The SVS serial communications port shall be configured for two-way communications send and receive, with the following parameters:

- Baud Rate – 9600
- Data Bit – 8
- Parity – 0
- Stop Bits – 1

14.4.7.2 Communications Data Format: Data formatting between the BSD and SVS shall comply with the American Standard Code Information Interchange (ASCII) standards.

14.4.7.2 Communications Data Format: For any instance where either no BHS Pseudo ID or IATA ID is available from the BHS to the SVS or SVS to the BHS, the 10 digits shall be populated with "?" marks (where a "?" is equivalent to an ASCII 63).

14.4.7.5 SVS to BSD Heartbeat: When the BHS detects the heartbeat from the SVS, the BSD shall automatically be enabled and the active screen will be "Waiting For Bag". This data will be a toggle between two separate ASCII values and shall be as follows every two seconds:

- Data format is <<STX,HB,ETX>> where
  - STX (02) = Start of Text
  - , (44)
  - HB = Toggles between H (72) and h (104)
  - , (44)
  - ETX (03) = End of Text

14.5.1 BSD Screens Design: The BSD Interface comprises different elements and specific visual characteristics that shall be replicated on every design. The visual design shall include:

- Font style: The font shall be a web-safe sans-serif typeface such as Arial, Verdana, or Calibri.

- All Capital Letters: Bag statuses, UICs, and operator messages shall be displayed in all capital letters.
- The elements to screen size ratio shall be maintained regardless of the display size.
- All colors used throughout the displays shall follow the colors in Table 14 2. (see text for details)

14.5.1 BSD Screens Design: The BSD structure shall include the following key elements:

- [BSD element] Station ID: Numbering convention in the form of "STATION –XX", which correlates to the BIS number in which it is mounted.
- Bag Information Fields:
  - Bag Status: Disposition of the bag as indicated by designator and color listed in Section 14.6.2
  - RBS Level: The EDS algorithm used to screen the bag (This is a placeholder for now. No additional information is available).
  - IATA ID or RFID: If an ATR is being used upstream of the EDS units, the IATA number shall be populated here. If an RFID system is being used, the RFID ID shall be displayed.
  - PSEUDO ID: The generated pseudo ID (either by the BHS or the EDS) shall be shown.
  - EDS ID: EDS screening line and EDS serial number used to process the current bag in the format of SS8 (G500)
  - Unique Identifier Cell (UIC): Used to identify when any of the following scenarios occur:
  - Duplicate IATA
  - Timeout
  - Communication Error
  - Length Change
  - Others may be added with an approved RFV
- Found at PE: PE ID that correlates to the location where bags that have been lost in tracking were "found".
- Operator Message Area: Used to display any messages for the operator.
- Primary Buttons: These represent the primary action typically taken by the operator. These also work as a trigger for the Bag Auto ID Transfer functionality when needed, as referenced in TSA's Integration Requirements Document (IRD).
- Secondary Action Buttons: These provide an optional action for the operator under certain circumstances.

14.5.2 BSD Statuses and High Level Processing Procedure: Baggage that arrives in the CBRA shall be limited to the following five statuses with their corresponding designator codes, color, and RBS level.

- **CLEARED** (Green) – Bags that received a clear status from the EDS or OSR. Cleared bags include:
  - Clear – Standard bag with RBS level - 0
  - PRE-Clear – Pre-Check bag with RBS level - P
  - SEL-Clear – Selectee bag with RBS level - S
- **ALARMED** (Red) – Bags that generate an automatic alarm on an EDS unit and were viewed but not cleared by the Level 2 OSR Operator. Alarmed bags include:
  - Alarmed – Standard bag with RBS level - 0
  - PRE-Alarmed – Pre-Check bag with RBS level - P
  - SEL-Alarmed – Selectee bag with RBS level – S

  - Timeout – Bags that received an alarm status from the EDS but timed out during OSR or didn't make it to the OSR at all. RBS level can be 0, P, or S.
- **OUT OF GAUGE** (Orange) – Bags that do not fit into EDS units. RBS level - UNK
- **EDS ERRORED** (Yellow) – Bags that received an error status from the EDS. RBS level – UNK
- **UNKNOWN** (Blue) – Bags that have become lost in tracking between the exit of the EDS and the BRP or forced unknown for security reasons. RBS level – UNK
  - Communication Error – BHS will assign this status in scenarios where a disposition has not been received by the BHS from the EDS. This status is NOT an indication of an EDS or BHS error, but indicates a possible communications error. Where the status is persistent, the BHS and EDS engineers should review the possible condition causing the error. RBS level – UNK
  - Length Change – BHS will assign this status to bags that are believed to have "changed" their length. RBS level – UNK

14.5.3 Station Disabled and Waiting for Bag Screens: After the BHS startup procedures are completed, the BSD shall remain DISABLED until an operator presses the ENABLE button shown in Figure 14 12 or logs on to the SVS with two-way communication.

14.5.5 Unique Identifiers Cell: There are five messages that may be displayed in the UIC: Reinsert, Comm Error, Length Change, Timeout, and Duplicate IATA; these shall be displayed as shown in Figure 14.2.

14.5.5 Unique Identifiers Cell: When a positively tracked bag arrives in CBRA with a Duplicate IATA message in the UIC, the system shall process the bag according to the bag status.

14.5.7 Bag Waiting Alerts: In an attempt to mitigate unnecessary dieback in the CBRA, a flashing visual alarm shall alert operators to a condition where manual intervention is required.

14.5.7 Bag Waiting Alerts: The following conditions shall trigger the Bag Waiting Alert on the BSD:

- If the BIS is available and a bag requiring manual intervention (i.e., pressing a button) is queued at the adjacent BRP, a bag waiting timer shall start.
- If the bag is left unattended for 15 seconds the BSD shall display a flashing BAG WAITING TOO LONG message in red until an action is taken on the bag as shown in the example in Figure 14 24. This applies to all bag type screens.
- If the bag is left unattended for 45 seconds the bag shall advance to an available downstream BRP.
- After the 45 seconds time has expired the BHS shall lock out the search bag button for 3 second before the bag departs to the next available Downstream BIS.

14.6.1 Bag Storage Capacity: The CBIS design shall be capable of storing the proper quantity of bags needed to avoid system diebacks. The following equations shall be used to determine the bag storage needed to meet this requirement:

$$Total\ bags_{to\ accomodate} = \frac{10min}{Average_{screening\ time}(min)}\ x\ Quantity\ of\ BITs_{Alarmed/OOG}$$

$$Bag\ Storage\ Capacity = Total\ bags_{to\ accomodate} - Quantity\ of\ BITs_{Alarmed/OOG}$$

14.6.1 Bag Storage Capacity: When analyzing the bag storage capacity needed for a particular design, the ILDT shall consider the third and fourth column from Table 14 3. (Bag Storage Capacity Needed for Domestic is 3 minutes per bag and International is 4minutes per bag.)

14.6.1 Bag Storage Capacity: The bag storage capacity shall be achieved using a combination of queues, inch and store conveyor belts, or other cost-effective means between the OSR 2nd/last chance divert point and the entrance to the CBRA as well as BRPs and Intermediate Queues within CBRA.

14.5 CBRA Functionality: The following horizontal dimensions shall be maintained in the CBRA:

The work space at the workstation and visual acuity ranges for off-station displays shall conform to the following ISO standards:

- 11064-01:2000 Ergonomic design of control centres – Part 1: Principles for the design of control centres
- 11064-02:2000 Ergonomic design of control centres – Part 2: Principles for the arrangement of control suites
- 11064-03:1999 Ergonomic design of control centres – Part 3: Control room layout

14.5 CBRA Functionality: Designers shall verify with local authorities that routes of egress within and external to the CBRA comply with applicable life safety codes. Additionally, sufficient clearance for utilization of bomb disposal robots shall also be taken into account.

14.5 CBRA Functionality: The CBRA shall be programmed to automatically apply two different queuing methods—the normal alarm line queuing method and the alternate alarm line queuing method—based on three queuing prioritization levels.

14.5 CBRA Functionality: BISs shall be enabled in upstream sequence only beginning with the furthest downstream station enabled and available station. The BHS shall inhibit an upstream station from being enabled if downstream BISs are enabled and available for operations.

14.5.6.1 Communication Port Parameters: The SVS serial communications port shall be configured for two-way communications send and

14.6.5 **Unique Identifiers Cell:** There are four messages that may be displayed in the UIC: Comm Error, Length Change, Timeout, and Duplicate IATA; these shall be displayed as shown in Figure 14 19.

14.6.5 Unique Identifiers Cell: When a positively tracked bag arrives in CBRA with a Duplicate IATA message in the UIC, the system shall process the bag according to the bag status.

14.6.1 Bag Storage Capacity: The CBIS design shall be capable of storing the proper quantity of bags needed to avoid system diebacks. The following equations shall be used to determine the bag storage needed to meet this requirement:

$$Total\ bags_{to\ accomodate} = \frac{10min}{Average_{screening\ time}(min)}\ x\ Quantity\ of\ BITs_{Alarmed/OOG}$$

$$Bag\ Storage\ Capacity = Total\ bags_{to\ accomodate} - Quantity\ of\ BITs_{Alarmed/OOG}$$

14.6.1 Bag Storage Capacity: When analyzing the bag storage capacity needed for a particular design, the ILDT shall consider the third and fourth column from Table 14 3. (Bag Storage Capacity Needed for Domestic is 3 minutes per bag and International is 4minutes per bag.)

14.6.1 Bag Storage Capacity: The bag storage capacity shall be achieved using a combination of queues, inch and store conveyor belts, or other cost-effective means between the OSR 2nd/last chance divert point and the entrance to the CBRA as well as BRPs and Intermediate Queues within CBRA.

14.6.2 Architectural Features: The CBRA shall be fully enclosed with segregating partitions extending to the structural deck to allow for the security and comfort of the TSOs. Conveyor wall penetrations in CBRA shall be equipped with security doors to completely secure the CBRA when the conveyor system is not running.

14.6.2 Architectural Features: The CBRA shall be provided with finished horizontal and vertical surfaces as follows:

- Flooring shall be composed of a safety/anti-fatigue material configured for a continuous installation under all TSO work and movement areas with a service-life of no less than seven years.
- Walls shall have durable, impervious surfaces, such as painted masonry, plastic laminate or drywall that is taped, bedded, and textured with epoxy or enamel paint.
- Ceilings shall include the use of painted suspended drywall, or suspended, lay-in acoustical tile at a minimum height of 9 feet. An acceptable design can include exposed structure with no ceiling. See Section 14.7.8 below for noise abatement recommendations.
- Access shall be provided with at least one set of double doors (or a rollup door) for access for equipment movement into and out of the area.

14.6.2 Architectural Features: Designers shall consult with local authorities to determine the proper protocols and routing for the removal of threat bags from the CBRA including a designated exit path for TSOs when a threat is discovered, as well as adequate access to the CBRA room for local authorities with threat containment units.

14.6.3 CBRA Physical Space Requirements: For space allocation planning, the size of the CBRA shall be adequate to allow for the number of queues and BISs that would be allocated based on the number of non-redundant EDS required at DBU+15.

14.6.3 CBRA Physical Space Requirements: The space requirements for the staging room for OS bags shall be based on the individual airport handling of OS bags.

14.6.3 CBRA Physical Space Requirements: Space shall to be allocated for the storing of hazardous materials outside of the CBRA. The space requirement shall be based on the historical frequency of these materials and the frequency to which the airport collects them.

14.6.3 CBRA Physical Space Requirements: The only equipment installed in the CBRA shall be directly required for the operations in that space, e.g., SVSs, BISs, and BSDs. No other equipment such as motor control panels, UPSs for EDS equipment, IT racks or any other equipment not directly related to CBRA operations shall be installed in the CBRA.

14.6.3 CBRA Physical Space Requirements: Designers shall verify with local authorities that routes of egress within and external to the CBRA comply with applicable life safety codes. Additionally, sufficient clearance for utilization of bomb disposal robots shall also be taken into account.

14.6.4 Horizontal Clearances: The following horizontal dimensions shall be maintained in the CBRA:

- The work space at the workstation and visual acuity ranges for off-station displays shall conform to the following ISO standards:
  - 11064-01:2000 Ergonomic design of control centres – Part 1: Principles for the design of control centres

- 11064-02:2000 Ergonomic design of control centres – Part 2: Principles for the arrangement of control suites
- 11064-03:1999 Ergonomic design of control centres – Part 3: Control room layout

14.6.5 Lighting: Luminance shall be measured at the surface of the BIS and found to be in the range of 500 to 750 lux. In other areas of the CBRA, the luminance shall not fall below 300 lux.

14.6.5 Lighting: Color corrected and full spectrum lighting lamps shall be used and fluorescent lights are preferred.

14.6.6 Heating, Ventilation and Air Conditioning: The CBRA shall be a climate-controlled space. Temperature and humidity control shall be supplied commensurate with the locale. A separate temperature control thermostat shall be provided for the CBRA.

14.6.6 Heating, Ventilation and Air Conditioning: If forced-air ventilation is provided, fresh outside air shall be delivered to the CBRA at rates specified by the American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE) Standard 62.1-2016 Ventilation for Acceptable Indoor Air Quality. The CBRA shall be under positive pressure relative to ambient BHS areas to minimize the migration of contaminants (e.g., products of combustion from tugs and vehicles, as well as outside dirt, dust, and debris) from entering into the CBRA.

14.6.7 Power and Communications: Power shall be provided to the CBRA to support TSA- and airport operator-provided equipment. The Project Sponsor shall coordinate the final requirements based on the actual equipment list and layout, but as a minimum:

- Two quad receptacles (120V/20A) shall be provided for each BIS to support screening operations and ancillary equipment.
- One duplex outlet shall be provided on the side of the back wall between the two BISs for access by cleaning personnel.
- Convenience outlets shall be provided on the perimeter walls as required by local codes.

14.6.7 Power and Communications: At a minimum:

- A telephone shall be provided for use by TSOs, with access to the airport communication network, and for placing outside calls.
- The network cabling shall be provided to support the BHS, EDS, and TSA workstations.
- All cabling and associated outlets shall be installed in a location where they cannot to be damaged by BISs or cause a safety hazard.

14.6.8 Connectivity to TSA Network: The connection of the CBRA ETD equipment to the TSA Network (TSANet) shall be provided via a “Dual Drop” consisting of 2 RJ45 Cat5e/Cat6 connections terminated at a wall or floor box.

14.6.8 Connectivity to TSA Network: In addition, the following requirements shall be met:

- All core drilling shall support a minimum of 4 “Dual Drops”
- All new fiber installations shall be single in conflict with 7.2.13.3-mode, 6-strand bundles enclosed in innerduct
- All cabinet installations require 2 110v 20A service
- All cabinet installations shall meet the local seismic rating requirements and can be floor/bracket mounted

14.6.9 CBRA Noise Abatement: The CBRA shall have adequate acoustical insulation so that the background noise levels do not exceed 70dBA as measured at the natural TSO standing points at each screening station using a time-weighted average over an 8-hour shift.

14.6.10 Ergonomic Design Dimesions: Peripheral equipment stations shall have sturdy and durable mounting systems that are adjustable to allow TSOs to function from a standing position with good posture in accordance with DOT/FAA/CT-03-05, Human Factors Design Standard for

Acquisition of Commercial Off-the-Shelf, Non-developmental, and Developmental Systems to accommodate the 95th percentile male and 5th percentile female.

14.6.11 Conveyor System Crossovers and Catwalks: CBRA conveyor system crossovers shall consist of up and down treaded stairs, a full railing system, and a toe-boarded catwalk. TSA access stairs and handrails in and around CBRA used on a routine basis shall be current OSHA 1910.25 or IBC 1011 compliant, whichever is more stringent.

14.6.12 Conveyor Belt End Points on Alarm Line: End points of in-bound conveyor belts shall have a photo eye installed across the conveyor belt to stop baggage from falling off the end. Termination photo eyes shall be located sufficiently upstream to prevent baggage straps from becoming entangled in the conveyor belt at the end point.

14.7.13 Design for Safety: The AL conveyor belt surfaces shall be smooth or semi-smooth to facilitate easier baggage retrieval.

14.7.13 Design for Safety : All motor drives and associated tracking devices shall not be intrusive to the screening workspace. The design shall use motor drives mounted on the opposite side of the inbound and outbound lines from screening personnel or, if this is not feasible, the designers shall ensure that all hazardous moving parts (e.g., drive shafts, roller spindles, bearings, bearing components etc.) are guarded and free from sharp or pointed edges to prevent accidental contact.

14.7.13 Design for Safety : End caps shall be installed on conveyor shaft bearing assemblies within TSO-occupied spaces to avoid operational hazards. End caps shall be attached to conveyor shaft bearing assemblies via mounting hardware. Press fit end caps or caps retained by tabs shall not be used.

14.7.13 Design for Safety: Any moving part located in any area of the CBRA where TSOs are required to perform their duties shall be shielded to avoid injury.

14.7.13 Design for Safety: The CBRA shall be designed to comply with TSA's "no-lift" policy.

14.7.12 Design for Safety: All aspects of the CBRA layout shall take into account the requirements for maintenance and custodial services access as stated in Mil Standard 1472G Section 5.9.

CHAPTER 16: INFORMATION TECHNOLOGY SECURITY REQUIREMENTS

16.1 Cybersecurity Demonstration: At TSA's request, cybersecurity measures shall be demonstrated to TSA.

16.2 Cybersecurity Requirement Assumptions: The CBIS control system shall have appropriate cybersecurity measures to ensure the system:

- Does not allow unauthorized access to any portion of the CBIS networks, controls systems or components
- Does not allow unauthorized access to data or unauthorized data extraction from the control system, inclusive of both SSI and non-SSI data
- Employs appropriate equipment and systems to isolate networks
- Has appropriate updates and patches applied throughout its lifecycle to ensure ongoing security

16.2.1 User Accounts: Individual user accounts shall be employed and the use of generic or multi-user accounts shall be prohibited. User accounts shall be terminated within 24 hours for those no longer requiring access. User accounts shall be audited on a monthly basis to ensure only required accounts are active. These requirements shall apply to remote access users as well.

16.2.2 Cybersecurity Plan: Cybersecurity plans shall be specific to the CBIS and shall include the following sections, where applicable (not all sections apply to all systems, e.g., not all systems have remote access capabilities):

- System architecture drawings
- User and account management controls
- Remote access policy and procedures
- Access log retention policy and procedures
- External network connections and access controls
- Disaster recovery plans and procedures

16.2.3 Incident Handling: The ILDT shall prepare an incident handling plan to deal with cybersecurity related attacks.

16.3 Firewalls: Network firewalls to control the flow of network traffic shall be employed. The firewalls shall restrict connectivity to and from internal and external networks to those with a need-to-know.

16.4 Remote Access: At a minimum, the system shall be secured as noted in *Configuring and Managing Remote Access for Industrial Control Systems*, April 2011, Centre for the Protection of National Infrastructure and the United States Department of Homeland Security.

16.4.1 Remote Access Logs: Remote access activities shall be logged and reviewed to ensure all access is by authorized personnel. At TSA's request, access logs shall be submitted to TSA within seven calendar days.

16.4.2 External Connections: Remote access shall be enabled only when required.

16.5 Software Maintenance and Updates: Appropriate software maintenance and patch management programs shall be employed to maintain the system security.

16.6 Network Segregation: The following networks shall be segregated, or "air-gapped" from all other networks:

- Neither the BHS nor any other airport network shall be connected to the network used by the EDS for transmission of images e.g. the Morpho MUX or L3 NEDS.
- Neither the BHS nor any other airport network shall be connected to the TSA data network unless specifically directed and authorized by TSA.

Wireless networks, whether part of the CBIS or its control system, shall adhere to the guidelines as noted in NIST Special Publication SP 800-153 Feb 2012 *Guidelines for Securing Wireless Local Area Networks (WLANs)*.

16.8.3 Specific STIP Design Requirements: The following STIP requirements shall be met:

- All ETDs and stand-alone EDSs shall have one "dual telecommunications outlet".

- When a multiplex server is present, connectivity to TSANet shall terminate at the multiplex server cabinet, therefore connectivity to TSANet for each EDS is not required.
- All core drilling shall support a minimum of four “modular jacks”.
- All new fiber installations shall be multimode fibers, either multimode fiber, either 50/125 or 62.5/125 micron fibers r 50/125 or 62.5/125 micron fibers, 6-strand bundles enclosed in inner duct.
- All cabinet installations shall have 2 110v 20A service.
- All cabinet installations shall meet the local seismic rating requirements and can be floor/bracket mounted.
- All newly installed and existing data jacks and associated patch panels shall comply with TSA’s approved scheme [see TSA Structured Cabling System Guidelines dated July 2012].
- Completed Data Capture Sheet and cable certification paperwork shall be provided to TSA prior to established ISAT date.
- All IT cabinet installations shall include a temperature and humidity gauge for monitoring purposes. HVAC requirements in IT cabinet spaces shall comply with all applicable OEM documentation.