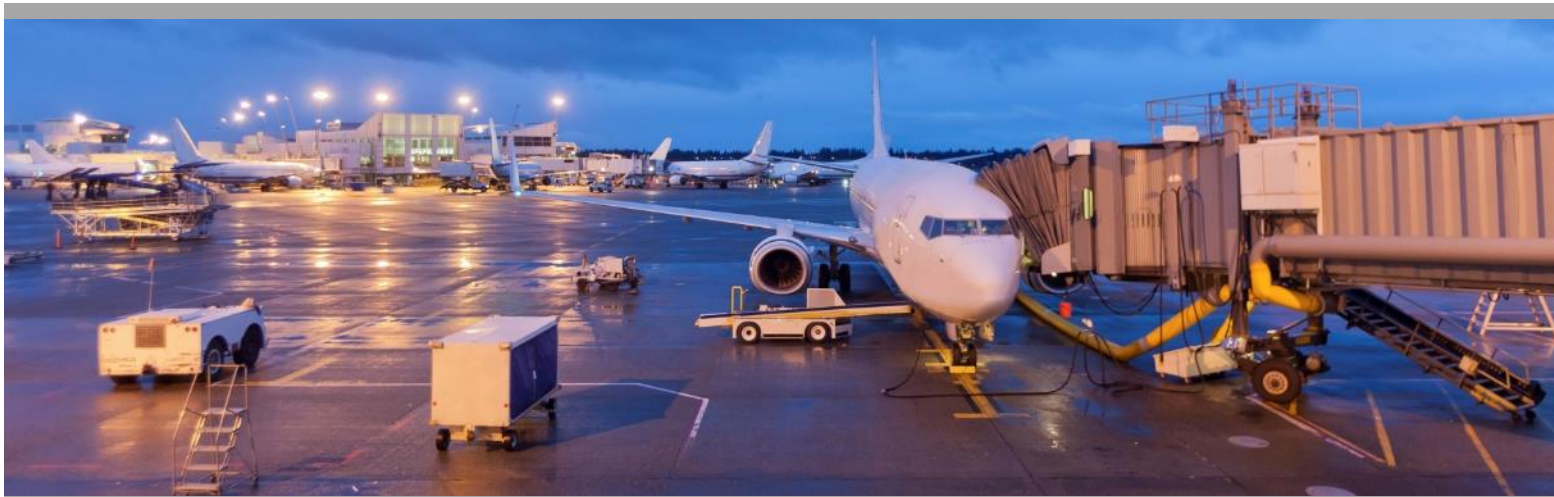




# PARAS PROGRAM FOR APPLIED RESEARCH IN AIRPORT SECURITY



PARAS 0024

March 2021

## Consolidated Receiving and Distribution Facilities at Airports

**National Safe Skies Alliance, Inc.**

Sponsored by the Federal Aviation Administration

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Minneapolis, Minnesota

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Funding for our programs is provided by the Federal Aviation Administration.

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## CONTENTS

<b>SUMMARY</b>	<b>xi</b>
<b>PARAS ACRONYMS</b>	<b>xii</b>
<b>ABBREVIATIONS, ACRONYMS, INITIALISMS, AND SYMBOLS</b>	<b>xiii</b>
<b>SECTION 1: INTRODUCTION</b>	<b>1</b>
1.1 Document Purpose	1
1.2 CRDF Overview	2
<b>SECTION 2: PLANNING</b>	<b>5</b>
2.1 Needs Evaluation	5
2.2 Stakeholder Identification and Engagement	5
2.3 Facility Location	6
2.3.1 Roadway Access and Distance to Terminal	7
2.3.2 Airfield Relationship	7
2.3.3 Airfield Vehicle Traffic	8
2.3.4 Planning Considerations for Facility Location	8
2.4 Developing the Building Program	8
2.4.1 Primary Spaces and Functions	9
2.4.2 Program Configurations and Adjacencies	10
2.4.3 Planning Scope for Building	12
2.4.4 Planning for Logistics and Operations	13
2.5 Planning to Implement a CRDF	13
<b>SECTION 3: SECURITY</b>	<b>14</b>
3.1 Security for Goods at Airports without a CRDF	14
3.2 Security for Goods at Airports with a CRDF	14
3.2.1 Key Security Enhancements	15
3.3 Security in Receipt of Goods	16
3.4 Inspection of Goods	16
3.5 Secured Areas	17
3.6 Security Cameras	18
3.6.1 Cameras for Security	19
3.6.2 Cameras for Operations	19
3.7 Transport of Goods	19
3.7.1 Assessing Operations	20
3.8 Chain of Custody	20
3.9 Secured Returns	20
3.10 The CRDF Security Plan	21
3.11 Personnel Security & Safety	21
3.11.1 Background Checks	21

3.11.2	Retention and Turnover	22
3.11.3	Workplace Policies	22
3.11.4	Worker Safety	22
3.12	Cybersecurity	22
3.13	Stakeholder Engagement	23
3.13.1	Airport Law Enforcement	23
3.13.2	Regulators	23
3.13.3	Concessionaires & Receiving Companies	23
<b>SECTION 4:</b>	<b>FINANCE</b>	<b>24</b>
4.1	Funding a CRDF	24
4.1.1	General Airport Revenue Bonds (GARB)	24
4.1.2	Special Facility Bonds	24
4.1.3	Direct Loan	25
4.2	Capital Project Delivery Models	25
4.2.1	Design-Bid-Build (DBB)	25
4.2.2	Developer – Public-Private Partnership (PPP or P3)	25
4.2.3	Finance, Design, Build, Operate, and Maintain (FDBOM)	26
4.3	Annual Operations and Maintenance Costs	26
4.4	Cost Savings for Consideration in Cost Assessment	27
4.4.1	Efficiency	27
4.4.2	Security	27
4.4.3	Operations	27
4.4.4	Tariffs and Insurance	28
4.4.5	Revenue Generation	28
4.4.6	Sustainability	28
<b>SECTION 5:</b>	<b>OPERATIONS AND LOGISTICS</b>	<b>29</b>
5.1	CRDF Delivery Procedures	29
5.2	Developing Operating Plans	29
5.3	Supplier Management Plan	30
5.4	Building the Schedule	31
5.5	Screening	32
5.6	The Logistics Plan	32
5.7	Sustainability	32
5.8	Timely Delivery and Reverse Logistics	32
5.9	Food Protection	33
5.10	Tracking and Reporting	33
<b>SECTION 6:</b>	<b>ARCHITECTURAL AND ENGINEERING DESIGN</b>	<b>34</b>
6.1	Stakeholder Engagement	34

6.2	Site and Building	34
6.2.1	Exterior Conditions	34
6.2.2	New Construction or Renovation	35
6.2.3	Enclosure, Structure, and Materials	35
6.2.4	Circulation, Signage, and Wayfinding	36
6.3	Systems and Equipment	36
6.3.1	Mechanical Considerations	36
6.3.2	Electrical Considerations	36
6.3.3	Equipment	37
6.4	Design	37
6.4.1	Airport Design Standards	37
6.4.2	High Performance Design	37
6.4.3	Human Factors in Design	38
6.5	Case Study Highlights	38
	<b>REFERENCES</b>	<b>40</b>
	<b>APPENDIX A: KEY DECISIONS CHECKLIST</b>	<b>A-1</b>
	<b>APPENDIX B: CASE STUDIES</b>	<b>B-1</b>
	<b>APPENDIX C: EXAMPLE RFP FOR CRDF OPERATOR</b>	<b>C-1</b>
	<b>APPENDIX D: CRDF PROGRAMMATIC AREAS</b>	<b>D-1</b>
	<b>APPENDIX E: CRDF LOCATIONS AND BUSINESS MODELS</b>	<b>E-1</b>

## TABLES & FIGURES

Table 1-1. CRDF Tasks and Procedures	2
Table D-1. Programmatic Areas	D-1
Table E-1. CRDF Locations and Status	E-1
Table E-2. Selected CRDF Business Models	E-1
Figure 2-1. Secure Portal Examples at CRDFs	9
Figure 2-2. Cooler and Freezer Example at a CRDF	10
Figure 2-3. Configuration A: Docks on Opposite Sides	11
Figure 2-4. Configuration B: Docks on Same Side	11
Figure 3-1. Example Employee Screening Portal	18
Figure 6-1 Dock Apron Diagram – Plan View	35
Figure B-1. Case Study 1: CRDF Plan	B-7
Figure B-2. Case Study 1: Type B-1 (Remote/Adjacent) CRDF Configuration	B-8
Figure B-3. Case Study 1: Carts Used for Goods	B-8
Figure B-4. Case Study 1: Receiving and Screening Portal	B-9
Figure B-5. Case Study 1: Screening Equipment	B-9



Figure B-6. Case Study 1: Logistics Center	B-10
Figure B-7. Case Study 1: Cooler and Freezer in Warehouse	B-10
Figure B-8. Case Study 1: Returns in Warehouse Cooler	B-11
Figure B-9. Case Study 1: Distribution Doors from Interior	B-11
Figure B-10. Case Study 1: Returns	B-12
Figure B-11. Case Study 1: Linens Receiving Area	B-12
Figure B-12. Case Study 1: Staff Screening Portal	B-13
Figure B-13. Case Study 2: CRDF Plan Diagram	B-16
Figure B-14. Case Study 2: Type B-1 (Remote / Adjacent) CRDF	B-17
Figure B-15. Case Study 2: Receiving Interior	B-17
Figure B-16. Case Study 2: Portal to Warehouse	B-18
Figure B-17. Case Study 2: Warehouse Looking at Portal	B-18
Figure B-18. Case Study 2: Cooler and Freezer in Warehouse	B-19
Figure B-19. Case Study 2: High Value Storage Areas	B-19
Figure B-20. Case Study 2: Returns in Warehouse	B-20
Figure B-21. Case Study 2: Distribution Door from Interior	B-20
Figure B-22. Case Study 2: Vendor Driver Receiving Station	B-21
Figure B-23. Case Study 2: Staff Screening Portal	B-21
Figure B-24. Case Study 3: Plan Diagram of CRDF	B-24
Figure B-25. Case Study 3: Type A-1 (Straddle) CRDF	B-25
Figure B-26. Case Study 3: Receiving Interior	B-25
Figure B-27. Case Study 3: Receiving Looking at Portal	B-26
Figure B-28. Case Study 3: Warehouse Looking at Screening Portal	B-26
Figure B-29. Case Study 3: Cooler and Freezer in Warehouse	B-27
Figure B-30. Case Study 3: Warehouse	B-27
Figure B-31. Case Study 3: Returns Room	B-28
Figure B-32. Case Study 3: Vendor Driver Receiving Station	B-28
Figure B-33. Case Study 3: Staff Screening Portal	B-29
Figure B-34. Case Study 3: Break Room Kitchen	B-29
Figure B-35. Case Study 3: Break Room Seating	B-30
Figure B-36. Case Study 4: Plan Diagram	B-33
Figure B-37. Case Study 4: Vendor Driver Check-In and Receiving Management	B-33
Figure B-38. Case Study 4: Interior of Receiving	B-34
Figure B-39. Case Study 4: X-Ray Device	B-34
Figure B-40. Case Study 4: Oversized Object Portal – Secure Side	B-35
Figure B-41. Case Study 4: Staff Screening Portal	B-35
Figure B-42. Case Study 4: High Value Storage	B-36
Figure B-43. Case Study 4: Combination Cooler/Freezer	B-36

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Figure B-44. Case Study 4: Staff Break Area with View of Secure Warehouse	B-37
Figure B-45. Case Study 4: Emergency Power Generator	B-37
Figure B-46. Case Study 5: Plan Diagram	B-41
Figure B-47. Case Study 5: Interior Loading Dock, Landside	B-41
Figure B-48. Case Study 5: Interior Secure Warehouse	B-42
Figure B-49. Case Study 6: Plan Diagram	B-45
Figure B-50. Case Study 6: Receiving Interior	B-45
Figure B-51. Case Study 6: Receiving and Employee Areas	B-46
Figure B-52. Case Study 6: Secured Logistics Sortation Area	B-46
Figure B-53. Case Study 6: Outbound Doors	B-47

## SUMMARY

This document provides airport executives and aviation industry professionals with guidance on the key features, planning, development, and operations of a Consolidated Receiving and Distribution Facility (CRDF). The intention of this document is to provide information and resources for a broad range of airport types, sizes, and needs in addressing the movement of goods into a secure airport area for a wide range of airport stakeholders.

The document provides an overview of the purpose of CRDFs, including its primary functions, and its advantages and benefits. It then defines and outlines CRDF planning, security, finance, operations and logistics, and architectural and engineering design. For each key element, the document outlines critical criteria, and addresses alternatives and options for implementing a CRDF based on a wide range of variables including airport type, location, and operations.

Because of synergies and interrelationships between elements of a CRDF, a review of the entire document is recommended to gain a comprehensive understanding of the CRDF concept. Planning guidance is provided regarding stakeholder engagement, needs evaluation, location, building program and CRDF operations and implementation. Security guidance is provided to address physical and electronic security, access control, and goods and personnel security management. Finance guidance is provided regarding funding options, capital project delivery models, annual operations and maintenance costs, recommendations for cost savings, and sustainability. Operations and logistics guidance is provided regarding identification of customer needs, developing operating plans, scheduling, delivery and reverse logistics, and tracking and reporting. Finally, architecture and engineering guidance is provided for site and building development, systems and equipment needs, design process, and case study highlights.

The appendices include key decisions for each aspect of a CRDF, case studies representing CRDFs at a variety of airport types, an example of an RFP for facility and operations development, CRDF programmatic areas, and CRDF business models.

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## PARAS ACRONYMS

<b>ACRP</b>	Airport Cooperative Research Project
<b>AIP</b>	Airport Improvement Program
<b>AOA</b>	Air Operations Area
<b>ARFF</b>	Aircraft Rescue & Firefighting
<b>CCTV</b>	Closed Circuit Television
<b>CEO</b>	Chief Executive Officer
<b>CFR</b>	Code of Federal Regulations
<b>COO</b>	Chief Operating Officer
<b>DHS</b>	Department of Homeland Security
<b>DOT</b>	Department of Transportation
<b>FAA</b>	Federal Aviation Administration
<b>FBI</b>	Federal Bureau of Investigation
<b>FEMA</b>	Federal Emergency Management Agency
<b>FSD</b>	Federal Security Director
<b>GPS</b>	Global Positioning System
<b>IED</b>	Improvised Explosive Device
<b>IP</b>	Internet Protocol
<b>IT</b>	Information Technology
<b>MOU</b>	Memorandum of Understanding
<b>RFP</b>	Request for Proposals
<b>ROI</b>	Return on Investment
<b>SIDA</b>	Security Identification Display Area
<b>SOP</b>	Standard Operating Procedure
<b>SSI</b>	Sensitive Security Information
<b>TSA</b>	Transportation Security Administration

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## **ABBREVIATIONS, ACRONYMS, INITIALISMS, AND SYMBOLS**

<b>A/E</b>	Architect and Engineer
<b>ASP</b>	Airport Security Program
<b>CAM</b>	Common Area Maintenance
<b>CBP</b>	Customs and Border Protection
<b>CRDF</b>	Consolidated Receiving and Distribution Facility
<b>DBB</b>	Design-Bid-Build
<b>DHL</b>	DHL Logistics Company
<b>ETD</b>	Explosives Trace Detection
<b>F&amp;B</b>	Food and Beverage
<b>FDA</b>	Food and Drug Administration
<b>FDBOM</b>	Finance, Design, Build, Operate, and Maintain
<b>FedEx</b>	Federal Express Corporation Delivery Services Company
<b>GARB</b>	General Airport Revenue Bonds
<b>HACCP</b>	Hazard Analysis and Critical Control Points
<b>LEED</b>	Leadership in Energy and Environmental Design
<b>O&amp;M</b>	Operations & Maintenance
<b>PPP or P3</b>	Public Private Partnership
<b>SDV</b>	Secure Distribution Vehicle
<b>UPS</b>	United Parcel Service
<b>WTMD</b>	Walk Through Metal Detector

## SECTION 1: INTRODUCTION

This guidebook covers planning, design, and implementation of a Consolidated Receiving and Distribution Facility (CRDF). It provides the needed know-how to implement a CRDF, if one is suitable to the airport's objectives. Because of synergies and interrelationships between elements of a CRDF, a review of the entire document is recommended to gain a comprehensive understanding of the concept.

### 1.1 Document Purpose

Each airport is a unique operation with individual terminal configurations, airfield layouts, financial operating models, and concessions program characteristics. This guidebook breaks down the various areas that need to be studied for each airport situation and highlights the factors that should guide the development of a CRDF program. Research includes applicable regulatory guidance from TSA and Airport Security Program (ASP) amendments. Case studies of implemented CRDF programs provide examples of the range of possible solutions.

Information in this document is organized by the key factors to be considered for a CRDF. The factors are arranged in the order they should be considered; however, the reader should not feel compelled to begin at the beginning. Sections and information are cross referenced, and the reader is directed to areas of the document where additional information can be located. Key factors include:

- **Planning process and issues**, including project team makeup, potential facility locations, connections to highway infrastructure, airfield access and routes, terminal delivery locations, building program, and activation process for a CRDF. **(Section 2)**
- **Security issues**, including passive and active approaches, considerations for specific product types, alternative methods for scanning procedures and equipment, site security considerations, security procedures for personnel, and integration with airport security programs. **(Section 3)**
- **Financial issues**, including how to fund a new facility (whether new or renovated), the delivery model to be used for design and construction of the facility, the cost model to pay for operating a CRDF, what types of charges will be levied against concessionaires or tenants, and if those costs are shared by the airport. **(Section 4)**
- **Operations and Logistics issues**, including the range of products or services provided by the CRDF, airfield logistics, terminal logistics, storage capacity, and desired operational metrics. **(Section 5)**
- **Architecture and Engineering Design issues**, including development of plan configurations, new construction versus renovation, sustainable design, human factors for workers, and future expansion or modification. **(Section 6)**

This document is intended to help a wide range of airport staff, including directors, managers, and administrators, as well as concessions program managers, security coordinators, and facility managers. The intended audience also includes concessionaires and vendors acting on behalf of the airport through an agreement. There will be relevant information for each group on the advantages of a CRDF, along with guidance and key points to consider in the implementation process. It is also intended that any reader, while focused on their area of expertise, can gain a broader understanding of CRDF operations and benefits for airports and their stakeholders. For example, a financial manager can gain an understanding of the financial impacts and benefits of implementing a CRDF program, and the important security benefits that can justify taking on those financial impacts.

## 1.2 CRDF Overview

### PRIMARY FUNCTIONS

The primary functions of a CRDF are summarized in Table 1-1.

**Table 1-1. CRDF Tasks and Procedures**

Primary Tasks and Sequence	Subtask
Receive materials from multiple vendors at a publicly accessible (landside) receiving dock	Generate receiving logs, timestamps, barcodes, or other tracking logs
Screen materials utilizing visual, electronic, or other means meeting or exceeding TSA requirements	
Approve passage of materials to secure, monitored area of CRDF	
Handle suspect materials/packages according to required procedures	Reject or approve
Store materials as necessary following screening in a temperature-controlled environment (ambient, refrigerated, or frozen)	Monitor duration and condition of stored materials
Package or otherwise organize screened goods for delivery	Transfer to dedicated pallet/cart/tote
Load, transport, and deliver screened materials via secure transportation to terminal airside loading docks for distribution at the terminal or other secure airside location	Deliver with vendor invoice, review by vendor against order
Retrieve materials, containers, or objects (returns) at terminal as required for return through CRDF	Prepare returns for retrieval by vendor

### KEY TERMS

The following key terms are important in understanding the functions of a CRDF:

#### Received Goods

Food and Beverage (F&B) and retail concessions primarily include food products, beverages, retail products, newspapers, and other dated materials and vending machine goods. Secondary concessions include items such as duty free, hotel, or convention materials, and displays and fixtures.

Primary operations items include uniforms and linens, and maintenance materials such as lighting, custodial and office supplies, airport fixtures, furniture, and equipment.

Primary service items include parcels from UPS, FedEx, DHL, and Amazon.

#### Returned Goods

Primary returned goods include outbound parcels, waste, recycling, food grease, beverage containers and kegs, linens, reusable packaging including pallets, carts, totes, and bread racks.

Secondary returned goods can include food beyond sell-by date for food recovery programs.

#### Destinations

Passenger-focused destinations include concessionaires, airlines, and clubs (airline and common use).

Operations or tenant-focused destinations include airport operations, airport law enforcement, airport storage, TSA, FAA, CBP, parcel carriers, suppliers, custodial firms, maintenance firms, and hotels.

Third-party contractors and construction sites are also potential destinations

## ADVANTAGES AND BENEFITS

A CRDF offers the following advantages and benefits:

- Protection against insider threats
  - Reduced number of badged personnel with AOA access
- Improved airside security
  - Reduced number of temporary badged / escorted personnel
  - Reduced number of third-party vehicles that access the airfield
  - Single point of accountability for security inspection procedures for goods
  - Optimized environment for delivery vehicles and handling of goods
  - Improved AOA safety through reduced airside vehicle traffic
- Terminal threat reduction
  - Reduced or eliminated curbside drop-off of goods by diverting vendor deliveries away from terminal
- Increased compliance with security regulations
  - Implementation of TSA-identified best practices for security of goods
  - Easier deployment of screening equipment (ETD, x-ray) for inbound goods
  - TSA Known Shipper standards applied to receivables
- Improved passenger experience
  - Reduced vehicle congestion at curbside
  - Reduced customer congestion at security checkpoint
  - Reduced shortage of goods at concessions through inventory tracking and just-in-time stocking
  - Reduced concourse congestion through coordinated delivery schedules
  - Fresher perishable goods and reduced waste through improved monitoring and temperature management throughout the delivery cycle
  - Increased safety through screening of all goods prior to being introduced into the terminal
- Cost savings and increased revenue for stakeholders
  - Theft reduction during goods screening
  - Reduced insurance cost for concessionaires
  - Reduced workload for concessionaires
  - Potential increased airport revenue from tenant storage opportunities in the CRDF
  - Reduced delivery “tariffs” on concessionaires’ goods for complex and time-consuming airport deliveries
  - Reduced insurance premiums for vendor delivery vehicles no longer driving on the airfield
- Enhanced workplace experience for tenants, concessionaires, vendors, and airport personnel
  - Streamlined operations, including more efficient access and delivery of goods to airport tenants and reduced work burden on stakeholder personnel
  - More effective use of tenant and concessions staff by reducing the number of trips to truck docks
- Effective use of airport terminal concourse space
  - Increased storage opportunities for airport tenants
  - Potential repurposing of existing terminal spaces, including in-terminal storage and loading docks
  - Reduction in capital expenditures on back-of-house square footage at new or expanded terminals



- Improved concessions delivery process and outcomes
  - Reduced vendor delivery truck wait times to unload
  - Reduced number of delivery vehicles on AOA roadways and around terminals
  - Scheduled delivery for all vendors
- Increased resiliency, sustainability, and social investment for the airport
  - Improved waste management through managed returns and recycling
  - Reduction in greenhouse gases and other vehicle emissions by shortening vehicle waiting and unloading time
  - Increased recycling and reuse of pallets, boxes, and other goods containers
  - Improved reverse logistics for unsold goods through a consolidated returns process
  - Centralized food grease handling
  - Opportunity to use alternative-fuel vehicles for delivery
  - Opportunity to initiate/participate in food recovery program serving airport campus and surrounding communities
- Improved Reporting
  - Enhanced data management for goods entering and leaving the airport
  - Greater operational reporting through consolidation of delivery activities

“Designers should reduce the number of delivery portals to sterile and secured/SIDA areas to the absolute minimum number possible based on the airport’s physical configuration. The goal should be to consolidate all deliveries to a specific location or a reduced number of locations, increase ramp safety and security, and reduce inspection costs. Especially with respect to receiving operations, designers should consider that any processes or practices that can be standardized will produce both operational and cost benefits, as well as increased levels of safety and security.”

(PARAS 0004, 2017)

## SECTION 2: PLANNING

The process of consolidating receiving and distribution at an airport requires examining existing airport operations and consulting with many stakeholders. The planning process can take up to 36 months, depending on what operations and delivery methods are chosen. No matter the scale of the facility, a consultant design team providing planning and architectural and engineering (A/E) professional services is recommended. The delivery method for the facility will determine how the professional design team is engaged. The team can be hired by the airport, or be part of a consultant team formed by a potential CRDF operator providing turnkey services. The A/E team can assist airport staff in identifying stakeholders. It should also be considered whether the airport has goals or requirements for participation by disadvantaged businesses, both in the design and construction phases.

While many aspects of a CRDF are similar to other buildings at an airport, there are several planning steps that are unique to a facility of this type. These include security requirements and consolidation of separate operations like fresh food receiving, recycling, and package delivery.

### 2.1 Needs Evaluation

The need or requirement for a CRDF may be identified through a planning process associated with terminal renovations or expansion, concessions leases, or because of a security study or event. A needs evaluation conducted in-house or by the consultant team can assist the airport in determining whether a CRDF should be developed. The team conducting a needs evaluation should have expertise in airport operations, airport security, concessions, and financing.

The evaluation examines security conditions and risks associated with passenger-facing products entering secure areas of the airport, including impacts on curbside, checkpoint, and dock congestion. Needs evaluation considers cost and quantity statistics and trends in order to recommend the appropriate scale and size of the CRDF facility. Examining what moves through existing docks and checkpoints, and understanding airport growth plans for concessions will determine what functions and goods will be included beyond the typical functions of a CRDF.

Needs drivers are factors that cause an airport to develop a CRDF. They can include:

- Replacement of an existing loading-dock facility located at a terminal
- Growth of a terminal or the airport
- Identified security hazards associated with deliveries near a terminal
- Identified deficiencies associated with logistics and the management of concessions goods
- Identified vehicle congestion at airside and landside locations

### 2.2 Stakeholder Identification and Engagement

The CRDF planning process requires a defined team of airport staff to organize and guide the project from conception, through construction, and into operations. Key roles for the airport team include a project manager with knowledge of current concessions operations, a financial person who understands the rates and charges of the airport and its tenants, and airport development staff with an understanding of the phases of a project. This team must identify a supporting stakeholder group of airport departments, tenants, and associated agencies that will have a role in the planning and development process.

Planning efforts must consider a broad range of programming inputs, and will therefore require a large stakeholder group. Airport staff including security, airport law enforcement, airport planning and engineering, real estate, leasing, concessions management, information technology, airport operations, and maintenance personnel should be represented. Concessions providers and any subcontractors involved with logistics like recycling and resource recovery must also be included. Agencies and terminal tenants including TSA and airlines should participate. Major concessionaires including F&B and retail tenants should also be encouraged to participate in the planning process.

Authorities Having Jurisdiction for the airport's local/regional government should be consulted to determine applicable land-use and building code regulations.

The airport staff team and A/E consultant team are responsible for stakeholder engagement. If the delivery method includes a turnkey CRDF operator involved via a PPP or Finance, Design, Build Operate, and Maintain (FDBOM) relationship, they should also be included as a partner with the team. The CRDF planning stakeholder group should be engaged at periodic intervals to validate the results of research, evaluate plans, and get consensus. Airport staff and the A/E consultants should discuss and agree on the appropriate degree of involvement from various stakeholders to maintain schedule efficiency.

Typical CRDF stakeholders include:

- Champions: support project goals throughout the process
- Airport Project Manager: manage contracts, consultant teams, and delivery
- Operator/Department having responsibility for operations
- Airport Operations
- Landside Operations
- Security and Law Enforcement
- CRDF Operators
- TSA
- Tenants
- Concessionaires
- Airlines
- Airline Clubs
- Primary Vendors

### 2.3 Facility Location

A key consideration when planning a CRDF is the location of the facility. Location impacts all aspects of the facility, including security, operations, and design, and should be considered early in the planning process. *PARAS 0028 – Recommended Security Guidelines for Airport Planning, Design and Construction* states:

Consideration should be given to using a remote, consolidated distribution center, physically separated from the terminal, that provides the airport an opportunity to screen deliveries prior to entry to the airport.... It is strongly recommended to avoid locating a loading dock adjacent to critical infrastructure and facilities (e.g., IT and communications hubs, emergency power generators, and primary emergency egress portals).

If a CRDF is located near a residential neighborhood, emissions can impact air quality and create unwanted traffic.

### 2.3.1 Roadway Access and Distance to Terminal

The function of a CRDF is to consolidate as much delivery traffic as possible to a single location. When critical operations are limited to a single access point, the need for redundancy in roadways and alternate transport modes grows in importance. When considering CRDF locations, the planning team should evaluate the roadways surrounding the airport, giving weight to both capacity and redundancy. Overlooking redundant routes could mean traffic accidents, construction activities, and other unexpected disruptions will negatively impact the CRDF operations, especially for just-in-time services.

Distance is as important as capacity and redundancy. The frequency of trips and miles traveled both off and on the airport campus has cost and emissions implications. Saving fuel and reducing emissions by reducing travel distance, and by utilizing alternative fuel delivery vehicles, provide opportunities for airports to advance their sustainability goals. Site selection should also consider the potential distance to recovery facilities or biofuel production sites if alternative fuel vehicles are anticipated.

### 2.3.2 Airfield Relationship

Another key aspect of location is relationship to the airfield. CRDFs have three primary relationships:

*Straddle:* A location on airport-controlled property that straddles the AOA line with the security line passing through the facility. For a straddle relationship, the SDV does not leave the AOA.

*Adjacent:* A location on airport-controlled property separated from the airfield boundary by any distance such that the SDV travels airport-controlled, publicly accessible roadways when traveling from the CRDF to the airfield.

*Remote:* A location separated from airport-controlled property and the airfield boundary by any distance such that the SDV travels public roadways when traveling from the CRDF to the airfield.

Any vehicle transporting screened goods from the CRDF to the terminal delivery node or other airside location is considered a *Secure Distribution Vehicle (SDV)*. Table 1-3 provides details of the relationship types and associated SDV considerations.

**Table 1-3. CRDF Airfield Relationship Matrix**

Airfield Relationship	Building Frontage	AOA-Line Proximity	SDV Traverses
Remote	Public	External	Public and Airfield
Adjacent	Public	External	Public and Airfield
Straddle	Public/Airfield	Internal	Airfield Only

A CRDF functions as a portal between public and secure areas of the airport. The most obvious location for this type of portal is straddling the airfield, with the security line passing through the facility, much like a passenger security checkpoint in a terminal. A straddle relationship facilitates the most straightforward configuration of operational processes and security, and minimizes behavioral or human risks. Flow through the facility can be linear, and staffing can be completely segregated between

landside and airside if desired, and SDV always remain in a secure area. In this configuration, the CRDF removes all goods traffic from airfield security gates.

While a straddling airfield relationship may be ideal, it does not mean that adjacent or remote locations do not also meet operational requirements and security standards. When evaluating these types of locations, the planning and design team must recognize that the SDVs may transit on public roadways after loading. Remote locations also add the potential for traffic impacts on public roadways, and can increase delivery times due to travel distance and screening at the airfield security gates.

Regardless of the airfield relationship of a CRDF, geofencing of SDVs to track and manage movement on and off the airfield is recommended. See Section 3 for additional information.

### 2.3.3 Airfield Vehicle Traffic

Whether considering a CRDF that is separate from or straddling the AOA line, the movement of SDVs when accessing and traversing the airfield should be examined. The frequency of delivery trips made by CRDF SDVs will add a pattern of vehicle traffic that, if not carefully planned, can conflict with primary airfield or emergency operations. However, the predictability and security benefits of the CRDF and SDV model has clear advantages over uncoordinated patterns of delivery by multiple vendors in vehicles that require escorting.

### 2.3.4 Planning Considerations for Facility Location

The list below identifies considerations when locating a CRDF:

1. Determine or review vendor delivery vehicle access off the airport campus
  - a. Confirm surrounding roadway network provides multiple access points to CRDF site via interstate freeway or major highway
2. Determine available land parcels at or adjacent to the AOA with connection to suitable roadway network
3. Determine available land parcels within required distance to AOA entrance gate (could be off airport campus)
  - a. Conduct traffic analysis at airfield entrance gate
4. Determine available existing facilities meeting building criteria at or adjacent to the AOA
5. Determine available existing facilities meeting building criteria within required distance to AOA entrance gate (could be off airport campus)
6. Determine or review secure delivery vehicle access on the airport campus
  - a. Examine roadway network within the AOA considering impacts to ARFF movements, airport law enforcement movements, and other airfield operations

A final consideration relative to CRDF location is determining whether a CRDF is the highest and best use of the property in question. CRDFs fulfill a secondary role in support of the primary passenger transport function of an airport, and should not be located on property that could serve that primary function or another greater revenue-generating function for the airport, such as property fronting aircraft aprons. In many cases, a remote location will help balance the highest/best-use issue.

## 2.4 Developing the Building Program

In conjunction with selecting a site, the size and configuration of the CRDF building itself must be determined and configured. This process is called programming. While not a building floorplan, the



program will include space criteria such as the number of docks and warehouse size. This program of spaces, at a minimum, allows for receiving, screening, and distribution of passenger-facing goods.

### 2.4.1 Primary Spaces and Functions

A functional CRDF includes public or landside loading docks with adjacent receiving space; a secure portal consisting of a barrier defining the SIDA boundary, with an opening for goods to pass through, and a mechanism or area for screening/scanning goods; a secure warehouse, including cold storage for perishable goods; a returns portal in the SIDA boundary for vendor reusable items; and a staging area served by a loading dock for distribution to the terminal(s). See Appendix D for a detailed description of Program Spaces and Functions.

The recommended program for a CRDF would add spaces and functions to support and enhance the process. These spaces include storage for returns and high-value items within the secure warehouse, and a rejection room or sally-port configuration within the secure portal.

**Figure 2-1. Secure Portal Examples at CRDFs**



**Top Left:** Security Portal with X-ray – Pallet of goods on a roller table ready to be lifted to the screening device

(Source: Landrum & Brown)

**Top Right:** Security Portal with X-ray – Roller table to lift goods to the screening device

(Source: C&S Companies)

**Bottom Left:** Security Portal with Sally Port – Secure enclosure for hand screening & inspection

(Source: Miller Dunwiddie)

The secure portal is a key element of the CRDF process (see Figure 2-1). The barrier portion of the portal can be configured with metal mesh partitions for visual transparency or constructed as an opaque wall. Remodel applications often utilize mesh partitions for ease of construction. When the portal is

configured with an intermediate space or sally port between two secure openings, a rejection function can be accommodated to remove contaminated goods before they enter the secure warehouse.

Another key space in a CRDF secure warehouse is temperature-controlled storage (see Figure 2-2). Coolers and freezers are required to store fresh and frozen goods before distribution. In one case study location, additional temperature-controlled storage was located on the non-secure receiving dock so that fresh foods could be loaded directly from refrigerated trucks into a cooler, to eliminate spoilage risks as goods are prepared for screening.

**Figure 2-2. Cooler and Freezer Example at a CRDF**



Source: Miller Dunwiddie

To supplement the receiving, screening, storage, and distribution areas, and to provide a healthy and appropriate workplace, employee support spaces are critical to CRDF design. These spaces accommodate staff screening and breakroom functions, offices for management, and dedicated spaces for communications and IT (with airport and CRDF systems segregated). In some case study locations, small employee fitness areas were included. The benefit of a comfortable work environment should not be overlooked when considering staff retention and attentiveness while on the job.

## 2.4.2 Program Configurations and Adjacencies

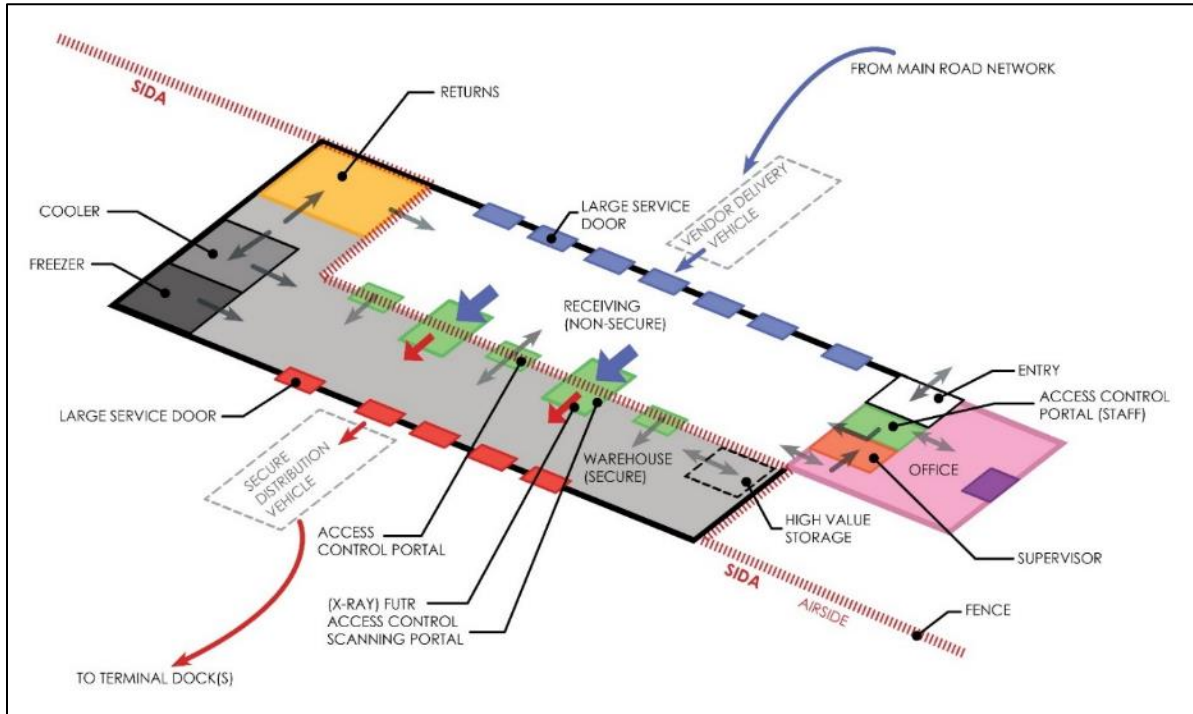
The configuration of spaces within a CRDF must foster the core mission of the facility: an efficient screening process. With large quantities of goods moving through the facility, and commitments to deliver goods within a prescribed delivery window, a linear alignment of spaces from receiving dock door to distribution dock door is optimal to minimize travel distance. New-build facilities should strive for this configuration.

Another adjacency that improves functional flow is placement of return storage and the return portal as a parallel path to screening. Return items can take up significant space. If not managed well, they can spill out into warehouse space, compromising efficient movement and safety. Return storage (including coolers) in support of community philanthropic missions for unused or expired items should be considered if programs are in place or planned.

Adjacencies that optimize security and loss prevention include supervisor rooms and offices with visual connection to both receiving and secure warehouse spaces. Independent staff access points to secure and non-secure areas from a single screening location limit the need to move between secure and non-secure areas.

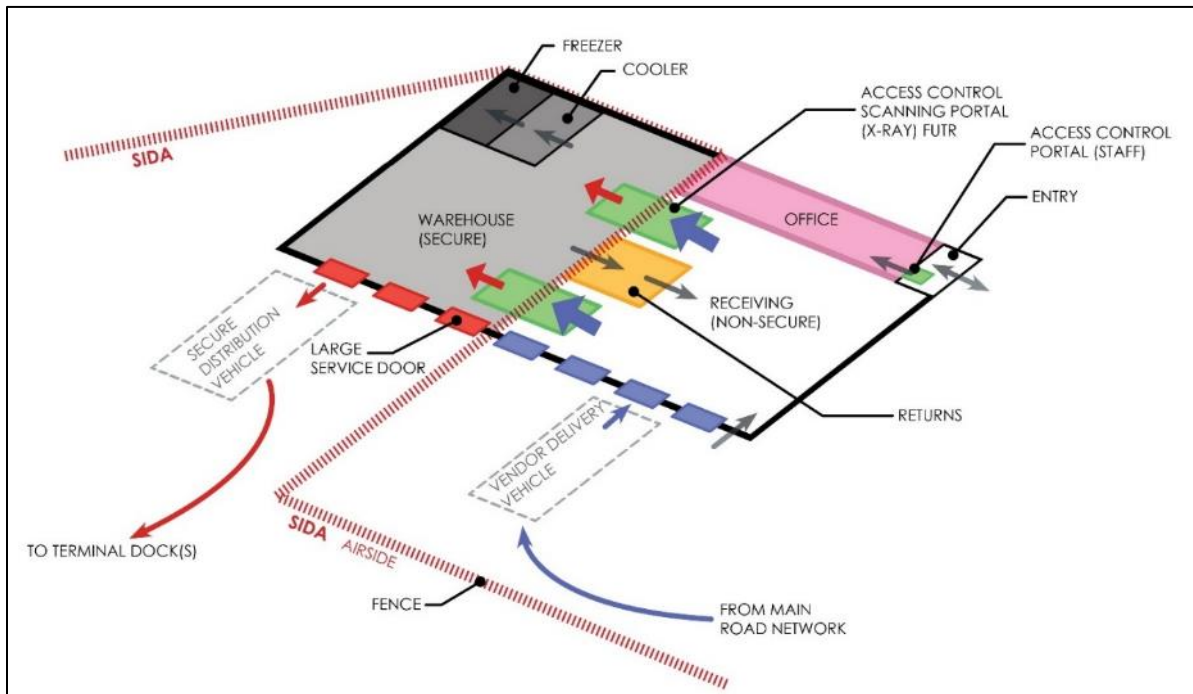
Diagrams illustrating typical program configurations are in Figures 2-3 and 2-4 below, followed by Table 2-2, which notes program elements and functions.

**Figure 2-3. Configuration A: Docks on Opposite Sides**



Source: Miller Dunwiddie

**Figure 2-4. Configuration B: Docks on Same Side**



Source: Miller Dunwiddie



**Table 2-2. Program Spaces and Functions**

<b>Space or Function</b>	<b>Required or Recommended</b>	<b>Adjacency</b>
Non-Secure Receiving Loading Dock	Required	Vendor Delivery Driver Check-in Area
Non-Secure Receiving Area	Required	Non-Secure Receiving Loading Dock
Access Control Secure Scanning Portal	Required	Non-Secure Receiving Area
Secure Warehouse	Required	Access Control Secure Scanning Portal
Warehouse Staging Area	Required	Secure Warehouse, Secure Distribution Loading Dock
Returns Portal	Required	Secure Warehouse, Non-Secure Receiving Area
Secure Distribution Loading Dock	Required	Secure Warehouse
Secure Cold Storage	Required	Secure Warehouse
Staff Screening	Required	Staff Office(s)
Non-Secure Receiving Cold Storage	Recommended	Non-Secure Receiving Area
Secure High-Value Storage	Recommended	Secure Warehouse
Returns Storage	Recommended	Secure Warehouse
Secure Portal Accept / Rejection Room	Recommended	Access Control Secure Scanning Portal
Supervisor Observation Room	Recommended	Staff Office(s), Secure Warehouse, Non-Secure Receiving Area
Staff Office(s)	Recommended	Staff Screening
Staff Break Area	Recommended	Staff Office(s)
Receiving Dock Work Area (desk)	Recommended	Receiving Loading Dock
Non-Secure Vendor Parking Area (waiting)	Recommended	Remote from CRDF
Secure Parking Area	Recommended	
Staff Parking	Recommended	Staff Office(s), Staff Screening
Vendor Delivery Driver Check-in Area	Recommended	Receiving Loading Dock
SDV Fueling Areas	Recommended	
Non-Secure Waste & Recycling Containers	Recommended	Receiving Loading Dock

### 2.4.3 Planning Scope for Building

The list below identifies considerations for the CRDF building program.

1. Determine the necessary size of the facility and number of inbound and outbound docks by taking into consideration enplanements, revenue per passenger numbers, and concessions gross revenues. In addition to docks, consider unique airport issues regarding recycling needs, grease management, sustainability, potential retail storage, package delivery, construction materials, and other unique goods that might pass through the CRDF, and how they will contribute to design.
2. Determine the necessary building infrastructure and sizing, such as refrigeration, freezer, generator, office space, storage areas, dock levelers, and fencing protective measures, etc.

3. Determine the building security infrastructure to meet TSA and airport law enforcement requirements, including future x-ray screening for materials, and staff screening equipment and procedures.
4. Determine communications needs for the facility based on airport and operations vendor requirements.
5. Determine the regulatory requirements associated with the facility operation.
6. Determine possible site locations for the facility and the associated road infrastructure in coordination with airport planning staff to ensure compatibility with the airport's overall plan. Future expansion capability allowed by a potential site should also be considered.
7. Determine material flow paths within the facility, and transport from the facility to the terminal.
8. Determine terminal node points for material entry and needs.
9. Determine if off-site concessions preparation facilities can be located adjacent to the CRDF.

#### 2.4.4 Planning for Logistics and Operations

Airport stakeholders should be involved in the planning process with an orientation of what a CRDF is, features of various CRDFs in other airports, and identification of needs in each department. These issues should be reviewed with airport planners and decisions made on a case-by-case basis as to their impact on CRDF size and functions.

Groups and staff representatives to be involved in stakeholder research should include Concessions, Facilities, Properties, Landside Ops, Airside Ops, Sustainability, Resiliency specialists, IT, Security (airport group first, and with their permission potentially the TSA FSD and staff), and the airport's Strategic Communications department.

### 2.5 Planning to Implement a CRDF

Implementation planning should start with the assignment of internal airport responsibilities. It will be critical to establish which department will be responsible for CRDF operations, and which individual within the department will be assigned to see the project through completion. This staff member may need to take on this assignment nearly full time for the planning and implementation period. Following a successful opening, the oversight of CRDF operations can be on average a 25% assignment, depending on the size of the airport and facility.

Additionally, an airport or contracted Project Manager may be needed during planning and start-up to effectively address all of the implementation issues and timing involved in the process (outlined in detail in the Finance, Logistics and Security chapters of this report). Some airports have sought specialized consulting services to fulfill this function.

See Section 5 for additional information on operations and activation of a CRDF. See Appendix A for a Key Decisions Checklist.

## SECTION 3: SECURITY

CRDFs offer a range of security benefits to airport operators, concessionaires, and regulators. This section covers the security procedures at a CRDF, including physical, personnel, and cybersecurity considerations and recommendations. All the elements noted are based upon proven practices from recent airport cases studies, coupled with the latest regulations and requirements found in domestic and international airport contracts for CRDF operations.

### 3.1 Security for Goods at Airports without a CRDF

Airports without a CRDF utilize two basic methods of inbound and return goods management: self-managed by the airport or tenant-managed with airport oversight. In both cases there are significant differences in the security infrastructures of CRDF and non-CRDF airports. Non-CRDF airports, in general, are observed to have a higher propensity for risk occurrence, as well as a higher level of impact from such risks.

For the most part, both of the above methods for non-CRDF inbound goods management utilize existing airport infrastructure to manage screening requirements of inbound goods. These methods include affording vendor delivery vehicles some level of access to the passenger roadways systems, airfield gates, the curbside, and airside terminal delivery locations, as well as close proximity to aircraft, and access to sensitive areas of the airport. Generally, when goods arrive at the airport, various non-intrusive visual inspections of the vehicle and other exercises are conducted to clear trucks, driver, and product before allowing access to the terminal via airside or curbside locations. At some point, a visual inspection of certain defined goods must be conducted in accordance with TSA security directives.

The security- and safety-gap concerns that exist at airports without a CRDF include:

- Undesired access of commercial trucks to sensitive areas of the airport
- Undesired access of commercial trucks to the AOA
- Time-consuming management of landside operations, including comingling of commercial trucks, shuttle services, and passenger traffic (security and commercial risk)
- Non-centralized screening of goods (many locations and/or methods with low standardization of protocol)
- Undesired health and safety compliance impacts for foodstuffs due to delayed delivery and/or lack of proper storage and shipping infrastructure
- Lack of consistent standards and systems
- Additional staff effort needed with return goods that are not properly tracked

### 3.2 Security for Goods at Airports with a CRDF

For airports with a CRDF, that facility will provide a single point of receipt for all inbound goods to be consumed within the airport terminal complex. The main objective of a CRDF is to operate as a throughput facility for the delivery (and return) of goods required for airport and tenant operation. These include F&B concession products as well as retail goods, custodial supplies, consumables, parcels (UPS, FedEx, Amazon etc.), and other tenant needs.

A CRDF (either onsite or offsite) centralizes and allows for oversight of this process, enhancing airport security in several meaningful ways, including:

- Ensuring goods are properly ordered by an authorized airport tenant
- Ensuring inbound goods are received from a known supplier, identified delivery vehicle, and approved driver
- Ensuring inbound goods are properly received within a pre-approved dock time
- Ensuring a professional inspection of the goods that is compliant with TSA security directives and interpretive requirements at that individual airport  
*Note: TSA security directives require the physical inspection of certain commercial goods; however, many CRDFs also incorporate voluntary efforts to supplement physical inspection with trace detection and/or x-ray of inbound goods*
- Providing space for the logistical organization of the screened goods in a secure area of the CRDF for consolidation and delivery to the customer with the chain of custody documented and tracked by electronic methods as well as other means
- Improving the secure return of goods with electronic tracking, documentation (including video), and set vendor communication protocols for process verification
- Enhanced ability to address insider threat by reducing the number of SIDA badges issued due to the consolidation of CRDF staff versus the multiple delivery vendors who would otherwise serve airport tenants
- Reducing the number of concessions personnel requiring SIDA badges due to CRDF staff distributing goods. Concessions personnel can be maintained at the lower Sterile Area access level

### 3.2.1 Key Security Enhancements

The CRDF also enhances security by removing barriers to security and addressing potential airport security gaps, including but not limited to:

- Eliminating vendor delivery trucks from the airfield by rerouting all vendor delivery vehicles to the CRDF
- Reducing the number of vehicles accessing the AOA through airfield security gates
- More consistent procedures for verification of drivers' credentials against an updated and approved drivers' authorization list  
*Note: Product and driver inspection standards differ airport to airport*
- Replacing multiple locations and methods for the inspection and screening of goods with a single location and standardized protocols that promote consistent procedures for the inspection and screening of goods
- Eliminating deliveries that enter through landside terminal loading docks and need to undergo a TSA-approved inspection process before moving to storerooms, concessions locations, or tenant offices in Secured and Sterile Areas of the airport
- Eliminating deliveries that are not coordinated with tenants for acceptance  
*Note: On many occasions these deliveries can be found left in hallways and loading docks, and could be subject to tampering or may fail to meet USDA food handling requirements. Current delivery practices at airports without a CRDF often involve time-consuming coordination challenges between delivery vendors and concessions employees for product hand-off, as well as unpredictable wait times by the delivery vendor for docks or access nodes to get to the storage area, concession, or other tenant location.*

- Reducing the number of delivery personnel (who only work at the airport for a fraction of their jobs) who need Sterile and other secure area access.  
*Note: In one large hub US airport, security records showed that there were over 1,800 badged and licensed delivery vendors serving concessionaire clients. A subsequent CRDF study estimated that these 1,800 vendors could be replaced by no more than 75 CRDF employees. This would constitute a nearly 96% reduction in this work group in subsequent security badges and individuals with access to non-public airport areas.*

### 3.3 Security in Receipt of Goods

The CRDF operator typically works with the airport concessionaires and tenants as a supplier in the new delivery process. The CRDF operator acquires delivery, stocking, and timing needs from the tenants, and confirms the orders as they are requested. The concessions delivery vendors also cooperate with and utilize tracking information from the CRDF operator (often barcodes). Tracking information is shared with tenants to confirm the order and delivery destination. The delivery vendors provide the CRDF operator with background security information on the drivers who will serve the airport, as well as the vehicles serving the airport.

The TSA's Known Shipper Program is a part of their Certified Cargo Screening Program. TSA certifies cargo screening facilities located throughout the United States. These facilities screen cargo prior to providing it to airlines for shipment on passenger flights. While each airport's receiving processes will be site specific, in general, security guidelines around CRDF deliveries mirror various aspects of the TSA's Known Shipper Program:

- The product is verified as having been ordered by an authorized user prior to arrival
- The product is delivered by a vendor in a vehicle that is known to the receiver
- The vehicle driver is known to the receiver and has been previously interviewed and their identity has been confirmed (in certain cases with an airport security badge)
- The product arrives within a reasonable window (generally 30 minutes) of the specified assigned delivery time

If these conditions are met, one portion of the security process has been successfully completed. If any of the four conditions are not met, a higher level of scrutiny is needed for the affected product, or in some cases, the entire order may be rejected. Known product, known delivery vehicles, known drivers, and compliance with assigned receiving times are important criteria that must be addressed in the CRDF receiving process

### 3.4 Inspection of Goods

Product received at the CRDF must next go through an inspection process before it is moved into a secure portion of the facility. There are several inspection methods available, and each airport will have its own inspection protocols. In general, the inspection processes may include:

- Physical inspection of each box, parcel, tote, or pallet. Pallets are usually, but not always separated so that each box can be inspected on all 6 sides. Following inspection, the pallet may be then repackaged and even shrink-wrapped to help keep

#### **Access Control Scanning Portal or Inspection Air Lock:**

A door, gate, room or scanning device located between the public receiving section (inbound) and the secured warehouse section (outbound) of the facility that is used for the physical and/or electronic screening of goods.

the unit together for subsequent delivery. It is a current best practice that this inspection happens in an inspection air lock section of the facility that exists between the public receiving (inbound) section and the secured warehouse (outbound) section of the facility. An inspection air lock or access control scanning portal should have an ingress door/gate and egress door/gate that are mechanically or electronically configured so that only one door/gate at a time can be opened, to prevent any pass-through of unscreened product or personnel.

- Explosive Trace Detection (ETD) equipment can be used for items that require a higher level of scrutiny.
- Palletized x-ray equipment (as shown in Figure 2-1, page 9) is now recommended as a best practice in most newly built CRDFs. Palletized x-ray screening has a high degree of security and is often a more efficient means of inspection, which can lead to optimizing use of labor resources and providing an additional security measure to guard against insider threats
- Underutilized CTX machines or other screening equipment can be used for various inspection needs prior to implementing palletized x-ray equipment.
- Product can be opened and physically inspected if necessary (e.g., in the case of an unresolved x-ray image). It is important that any inspection include security cameras to ensure proper protocols are followed.

The inspection process is a critical security function in a CRDF, and the TSA places special attention on this area during any facility inspections or testing. For advanced CRDFs, x-ray and ETD operator experience, training proficiency, equipment maintenance/certification, process oversight, and operator work standards are critically important to maintaining security screening integrity and limiting the risk of prohibited-item detection failure. Once product successfully clears the inspection process, it moves into the secured area of the CRDF (see [PARAS 0019 – Employee/Vendor Physical Inspection Program Guidance](#) for additional information on the inspection of vendors and goods in an airport).

### 3.5 Secured Areas

The secured warehouse area of a CRDF is where the screened product is sorted and staged for delivery to customers at the terminal. This area is typically secured by a full height wall or security fence and is accessed through access-controlled doors or gates. Where the facility straddles the AOA fence line, the CRDF is typically the airport's access control system for goods. This secured area is typically two-thirds of the facility's footprint and consists of a large floor space, the facility cooler, a freezer, and a secure/caged area for liquor, duty-free, and other high value goods. The entire warehouse is controlled access and under camera surveillance.

Upon arrival to work, employees are typically screened through a walk-through metal detector (WTMD), and all personal items are physically inspected before being stowed in the employee support areas of the facility. Individual airport security plans will dictate the level of access granted to employees. Typically, once screened, CRDF employees may exit and enter the secured and non-secured sections of the facility unimpeded. However, if employees go outside their controlled operating areas, depart a vehicle on the public side, or leave the facility on break, they must be rescreened.



**Figure 3-1. Example Employee Screening Portal**

Source: Landrum & Brown

The floor in the CRDF secure area is often taped or painted into sections that are used for logistical staging of goods. Product is stacked in these areas for efficient loading into secure delivery vehicles prior to the predetermined time for departure. Product in the freezers and cooler are also organized in the same manner.

For CRDFs straddling the AOA fence line, the outbound dock doors provide access to the airport's AOA and access to the terminal buildings via airport roadways. The airport's badge access control system is typically utilized to open the dock doors. The airside delivery trucks are usually tightly parked against the building with the use of dock shelters to provide a solid seal, maintain a secure boundary, and to keep the weather out. The trucks themselves are then filled with a first in/last out loading scheme for efficient delivery to the node points where drop-offs are made in the terminal complex.

In the case of an off-site facility, the trucks are also considered secured once loaded with the closed doors secured electronically or by a system that allows security personnel at access gates to ensure that they have not been opened or tampered with. In addition, some CRDF delivery vehicles are "geo-fenced" by GPS-enabled systems with mapping information that is shared with access gate security staff. In one example at an off-site CRDF, it was reported that the geo-fencing data had shown the vehicle had detoured off the road to the airport from its designated route, and the guard would not allow the vehicle to access the AOA. It turned out that the vehicle had been sent on an errand to a nearby hardware store earlier that day. While the immediate security situation was readily cleared up, it demonstrates that the systems do work.

### 3.6 Security Cameras

Typically, airport law enforcement or security staff require cameras in critical areas of the CRDF (access points, card readers, exterior fence line, etc.) The CRDF operator will require the same camera views, but will generally ask for additional cameras to ensure every step of the process is under surveillance for

product security, employee safety, and work rule compliance. It is also recommended that LED fixtures be installed in the working areas of a CRDF, as security cameras work best with this lighting type.

In early CRDFs, both airport security and the CRDF operator work groups installed their own camera systems at double the infrastructure and operation and maintenance (O&M) costs. It has been shown in several airport applications that key cameras can be “shared,” with images going back to each work groups set of servers. It is also recommended that two separate server rooms be built in any new or renovated CRDF to serve these work groups’ dual purposes.

### 3.6.1 Cameras for Security

Cameras in a CRDF are required for an airport’s law enforcement or internal security group for the following reasons:

- To immediately address any card access issues at card readers
- To monitor the facility during off-hours
- To observe and record the behavior of employees and delivery vendors in the case of any investigative needs
- To serve as a warning to potential wrongdoers that their actions are being observed and recorded
- For other security and law enforcement reasons (and forensic analysis)

### 3.6.2 Cameras for Operations

Cameras in a CRDF are required for the CRDF operator for the following reasons:

- To document the safe and secure movement of goods through the process
- To validate proper inspection methods and custody-chain of goods processing
- To serve as a record of the CRDF processes, as a backup to electronic or other documented means of tracking
- To serve as an additional record for FDA food handling requirements.
- To verify employee compliance with work rules
- To determine whether missing items were misplaced, lost, or stolen in the CRDF processes

## 3.7 Transport of Goods

CRDF operators work early on with the airport to develop the safest and most efficient delivery nodes and truck routes. This creates a template or plan for each day of the week that is followed by CRDF operators.

Retail and F&B product are often pre-staged for early morning deliveries and loaded into the refrigerated panel trucks in a “first in/last out” process to match the timing of their drop-offs. Depending on the security plan for each airport, when the loading of the truck is complete, the door of the truck is closed and sealed (electronically or by another approved method). This can ensure that the truck has not been tampered with, and in the case of an off-site CRDF, the gate security guard’s inspection processes may be streamlined.

Upon arrival at a stop in the airport delivery process, the vehicle driver follows the set procedures for unloading at the location, and then the driver closes and secures the truck’s door before making the



delivery. The delivery is generally planned and timed in the same manner as receivables, and the tenant meets the CRDF employees to officially take receipt of the goods at a predetermined time and location.

### 3.7.1 Assessing Operations

An example standard used by CRDF operators to objectively assess themselves is “delivered as promised.” Components of the standard may include:

- Was the order complete?
- Was it on time?
- Were any deficiencies addressed?
- Did the customer properly sign off on the order and take possession?
- Did the operators bring back used or recycled product as a return?

The result is shared internally with CRDF staff so they can monitor their performance appropriately. It is also shared with the customer and the airport so all can be assured that the process is efficient and working as designed. This close attention to detail and timing also provides flexibility to change operations when needed.

## 3.8 Chain of Custody

Chain of custody can be defined as the chronological documentation, or paper trail, that records the sequence of custody, control, transfer, analysis, and disposition of physical or electronic evidence. Most CRDFs basically operate as a pass-through facility on behalf of the airport and its tenants’ customers. Therefore, chain of custody is very important from a security perspective.

Some CRDFs have built or have expansion capacity for secure-side integrated storage areas that allow for storage of screened goods. Within the integrated storage area, “stock item” goods can be repackaged (for retailers), kitted, prepared with other items such as sandwiches or other foods preparation items, and then delivered to tenants when requested. The integrated infrastructure further centralizes security, and affords direct oversight of tenant operations security, without any conflict of interest, by an independent security process and operator.

When chain-of-custody protocols are followed correctly and documented through electronic or other means already described, all tenants and airport security personnel can be assured that the product delivered to Sterile and Secured Areas of the airport has been properly received, inspected, sorted for distribution, and handled correctly right to the point of the tenant’s acceptance of the product. The protocols also ensure that high risk items have received additional attention, while lower risk items are properly handled. In some CRDFs, high risk items are system-tracked through the entire chain of custody process.

## 3.9 Secured Returns

Generally, about 10–15% of the CRDF building and staff time is committed to various reverse logistics items such as reusable container returns or product returns. Occasionally, product can be returned when orders are incorrect, the customer refuses acceptance of the delivery, or there is a defect with the product. Most often the returns are related to reusable containers that are collected when product is consumed. Reusable containers such as pallets, plastic wrap, beer kegs, CO2 canisters, totes, bread and pastry racks, and soiled linens need to go back to the CRDF to be returned to the suppliers or for recycling.

When collection and delivery of returns are not managed properly, it often falls on airport staff, contracted custodial staff, or contracted recycling vendors to address the collection of these materials and ensure proper handling and disposal. Ideally, the CRDF trucks go out to the terminal full, and they come back with these types of returns. A specific section of the CRDF is set aside for this activity (generally 15% of the size of the CRDF warehouse). Often the returns can be sent back on that specific vendor's delivery truck the following day, which is an efficient manner of handling returns and reusable items. While the product's journey is from the Secured and Sterile Areas of the airport back to a non-secured area of the CRDF, this backwards flow also has the security benefits of the documented and professional handling of returns.

### 3.10 The CRDF Security Plan

This chapter highlights the key security processes for product at a CRDF. Each airport has its own security needs, and for CRDF operators these may require two separate kinds of formal CRDF Security Plans. If duty-free concessions exist at an airport, a specific Duty-Free Plan for the receipt, inspection, and delivery of US customs bonded goods must be developed. This document is generally 10–15 pages long and documents the unique handling procedures for bonded goods. Flow charts are developed, and every step of this process must be defined. While reviewed and approved by the airport law enforcement/security team, final approval rests with the Customs and Border Protection (CBP) Port Director who oversee these processes.

The formal CRDF Security Plan is often 30–40 pages long. It is generally spelled out in the RFP process, and is required of, and provided by, the CRDF operator. As with the duty-free products, every step of the process is defined in this document and flow charts are often included.

Airports are required to amend their Airport Security Program (ASP) for CRDF operations. The Airport Security Coordinator (ASC) must request the ASP amendment language from the TSA headquarters' Policy, Plans, and Engagement office or the Federal Security Director (FSD). The ASC submits the amendment to the FSD for approval before CRDF operations commence.

### 3.11 Personnel Security & Safety

Airport operators must vet and periodically reassess personnel with access to CRDF facilities and systems. While some overarching regulations from TSA mandate background checks for badge holders, airports have the option of setting and enforcing additional requirements based on specific access levels.

Airports must consider the security vulnerabilities introduced by high turnover or low morale. Elements like training, minimum wage, and employee retention can serve as tools to enhance the security posture of CRDF personnel.

Personnel requirements must span the entirety of the CRDF operation. Beyond the workers at the CRDF, airports must consider the security requirements for delivery staff, concessionaires receiving material, and all elements in the chain of custody. Personnel security considerations for CRDF personnel are noted below.

#### 3.11.1 Background Checks

Airports conduct background checks on badge holders in accordance with federal regulations under 49 CFR § 1542 Subpart C, TSA Security Directives, and local ordinances. CRDF personnel who access airport property are subject to these checks, including Criminal History Record Checks and Security Threat Assessments.

### 3.11.2 Retention and Turnover

The security posture of CRDF operations is affected by turnover, retention, and pay incentives.

Investments in training and career development as well as higher wages can increase retention rates for jobs related to security and public safety at airports, and for facilities like CRDF operations (Gallear, 2017). Best practices in CRDF personnel retention include, but are not limited to:

- Pay evaluation for screener if the CRDF is using x-ray technology; x-ray screeners at CRDFs should have pay rates tied to those of TSA screeners
- Institute skill development policies and career path definitions
- Promote job rotation and cross-training

### 3.11.3 Workplace Policies

Personnel who work under the influence of alcohol, illegal drugs, or controlled substances undermine the security of the CRDF. Violations of workplace rules in this area must be addressed.

Other examples of unacceptable CRDF workplace conditions and behaviors that negatively impact safety and wellbeing of employees include unwanted physical contact or intimidation, verbal threats of physical harm or violence, or any other actions that are threatening, hostile or disruptive in nature; possession of weapons in the workplace; harassment or bias based on sexual orientation, gender, religion, and race; and an abusive or hostile working environment.

### 3.11.4 Worker Safety

CRDF worker safety includes the use of Personal Protective Equipment (PPE) such as gloves, hardhats where required, eye protection, safety shoes, and appropriate uniforms and reflective vests.

Specialized training is also very important for CRDF employees. Most airports require comprehensive AOA drivers training and licensing. In addition, CRDF staff must also be trained to navigate congestion at terminal node docks, drive dock equipment, lift goods safely, and operate EDS and x-ray technology. Customer service training for successful interaction with tenant customers and members of the public should not be overlooked.

Many airports have instituted face mask requirements, hand sanitizing stations, social distancing protocols and other measures to protect against the spread of COVID-19. CRDF employees should always be in compliance with any health and safety protocols when they handle food and other products that may come into contact with the traveling public.

## 3.12 Cybersecurity

Security systems within and surrounding the CRDF are likely to be connected to the internet. Connection to external IT systems introduces a need for cybersecurity to prevent accidental or malicious compromise of the CRDF. System configurations and settings are subject to tampering, such as directing items from the warehouse to the wrong concession, or tampering with refrigeration temperatures.

Airports should follow cybersecurity best practices and guidelines from the National Institute of Standards and Technology (NIST) Special Publication (SP) 800-53, specifically Appendix D, Section PE. Topics covered include:

- Physical and environmental protection policy and procedures
- Physical access authorizations, control, and monitoring
- Power equipment and cabling
- Emergency power, lighting, and shutoff
- Temperature and humidity controls
- Fire and water damage protection
- System components
- Asset monitoring and tracking

A CRDF should be included in any airport cybersecurity program. Expert consultants often assist airports in addressing cybersecurity issues.

Additionally, [\*PARAS 0010 – Guidance for Protecting Access to Vital Systems Impacting Airport Security\*](#) also addresses system cybersecurity considerations at airports.

### 3.13 Stakeholder Engagement

CRDFs resemble supply chain operations that involve a range of stakeholders. Security must be considered through the entire CRDF process and across every entity involved. Standardized protocols and security measures should be defined to span the entirety of the process and consider affected groups. This section identifies best practices for engaging key security stakeholders as an airport operator.

#### 3.13.1 Airport Law Enforcement

Airports may have police coverage from a city police department or from an independent airport law enforcement department. In either case, it is critical to meet with the police team and the airport's security coordinator early in the process.

#### 3.13.2 Regulators

Airports considering CRDF operations must coordinate with TSA on any required ASP amendments, impacts to public area security, and other security items related to terrorism activity. In May 2017, the TSA issued the Public Area Security National Framework. Airports implementing CRDF changes are likely impacting public area movement (e.g., landside operations). The current publication is found here: [https://www.tsa.gov/sites/default/files/pass\\_national\\_framework.pdf](https://www.tsa.gov/sites/default/files/pass_national_framework.pdf).

TSA's Policy, Plans, and Engagement office has also developed draft language for airport ASP amendments. However, airports must coordinate any ASP changes with their local TSA team and FSD.

#### 3.13.3 Concessionaires & Receiving Companies

Concessionaires, airlines, and other entities receiving materials from the CRDF must adhere to product delivery security measures as well. Their input can provide important information for the CRDF operation regarding chain of custody and overall security.

## SECTION 4: FINANCE

This section discusses funding, capital delivery models, and operations and maintenance.

### 4.1 Funding a CRDF

Several factors need to be considered in the funding of a CRDF. Given that a CRDF is not eligible for funding with Passenger Facility Charges (PFC), FAA grants, or state grants, the funding and financing of a CRDF must fall to the responsibility of the airport and/or a third-party developer. This section addresses four general approaches that are available for airport consideration in funding a CRDF.

Sometimes, the CRDF is included as part of a larger capital project such as the construction or expansion of a new terminal. At other airports, a CRDF is included as part of the airport's overall capital program. In other examples, it is a standalone project, possibly connected to a concessions program upgrade. Each approach may dictate the best method to finance the project.

Typically, the primary source of funding for a CRDF is through airport-generated cash (funds available from its unrestricted cash reserves that have been generated from its annual cash flow) and/or through some form of financing.

Financing can be in the form of a direct loan with a bank or through the issuance of revenue bonds (either special facility or general airport revenue bonds [GARB]). Alternatively, the airport could choose to have a private developer fund the construction of the facility through a Public Private Partnership (PPP) approach. Read more about this approach in the Section 4.2, Capital Project Delivery Models. Each of these financing approaches is described briefly below.

#### 4.1.1 General Airport Revenue Bonds (GARB)

A more traditional approach to financing a CRDF would be through the issuance of GARBs, which are considered municipal bonds. Under this financing approach, GARBs with a 20- to 30-year term, are secured by the airport's general revenues, including airline revenues, parking revenues, terminal concessions, and other airport revenues sources. As a result, GARBs are considered less risky compared to special facility bonds (discussed below), and therefore generally have lower interest rates. The primary drawback to using GARBs for the financing of a CRDF, however, is that they are secured by the airport's general revenues and can potentially lower the airport's overall financing capacity for other projects.

#### 4.1.2 Special Facility Bonds

Special facility bonds, which, like GARBs, are also considered municipal bonds, can be another approach to financing a CRDF. Unlike GARBs, special facility bonds are secured solely based on the revenues of the facility being financed—in this case the CRDF. The primary benefit of special facility bonds is that they are not secured by a pledge of the airport's general revenues, and therefore do not impact the airport's financing capacity or bond ratings for other facilities such as the airfield, terminal, and other landside facilities. Since special facility bonds are secured by a single revenue source, they are considered riskier than a pledge of general airport revenues. For these reasons, depending on the overall strength of the facility's revenues relative to the annual debt service for the facility, special facility bonds can sometimes have higher interest rates.

### 4.1.3 Direct Loan

Another approach to financing the CRDF would be to solicit a bank for a direct loan (private placement). This approach is like special facility bonds, except that a direct loan is a private bank loan with a bank and does not have multiple investors. Private bank loans are generally simpler to issue and more streamlined than issuing municipal bonds.

Because one bank is bearing all the risk for the loan, the loan application can often be more heavily scrutinized. Bankers will be less willing to take on long term risk in relation to the length of the loan and/or the amount of capital they will loan. Unlike municipal bonds that can go out for a term of 30 years, banks will often limit the term of a direct loan to 20 years or less. Direct loans generally have higher interest rates, but not always.

## 4.2 Capital Project Delivery Models

### 4.2.1 Design-Bid-Build (DBB)

Traditional delivery methods for CRDF projects at airports generally involve Design-Bid-Build (DBB) construction contracts with a corresponding (or later) procurement RFP for a CRDF third-party operator. Under this approach, the airport will hire one or more firms to design and build the CRDF, and the facility will be financed by the airport. Once the CRDF is constructed and ready to be put into operation, the airport will then enter into an operating agreement with a third party to operate the facility. Typically, contracts with a CRDF operator have a term of 8–10 years, with termination clauses based on their performance; if the third-party operator's performance is not acceptable, a replacement can be found. This type of agreement is generally typical of other similar airport service provider contracts.

In most CRDF projects undertaken using a DBB approach, the third-party operator is required to fit-out the facility and supply the delivery vehicles, resulting in a significant capital investment. One drawback with the traditional DBB approach is the CRDF operator is often selected later in the process. Since the operator is not involved in the design, critical facility elements may be missed. This can result in physical adjustments needing to be made after construction of the facility, adding expense. Best practices suggest that a CRDF operator should be selected early in the process and involved in conceptual and final design. This may be difficult to accomplish with traditional airport procurement processes associated with DBB delivery.

### 4.2.2 Developer – Public-Private Partnership (PPP or P3)

Some airports have successfully involved private developers in the process to design, build, and operate the CRDF. Typically, the private developer is given a longer-term contract (15 to 25 years) under a PPP approach. This approach is typically taken to avoid the challenges with adding the CRDF to a capital program, or the desire to have a private party offering a quicker and potentially less expensive delivery solution. Using a private developer to plan, build, and operate the facility can also minimize the financial risk to the airport without affecting bonding capacity.

The private developer is also often required to select a third-party operator of the facility once it is operational. In the case of one large hub airport in the Western U.S., the selected private developer engaged a major logistics manager as the third-party operator, who was selected early in the process in order to participate in the design phase of the project. The result was very successful: very few design exclusions were noted, the facility is Leadership in Energy and Environmental Design (LEED) Gold certified, and it serves as a model CRDF in the United States.



The developer, in effect, owns the building and leases it back to the airport over an extended period. The airport pays the logistics manager to operate the facility. This process is generally more streamlined and offers a quicker delivery route than DBB. The airport has effective control over the third-party vendor, and may rebid the operating contract according to their procurement protocols.

#### 4.2.3 Finance, Design, Build, Operate, and Maintain (FDBOM)

As the industry has matured, at least one CRDF operator (logistics manager) has secured a strong capital partner, and can now work with an airport in a comprehensive FDBOM delivery method. This approach has the same benefits as the PPP developer model, but without additional third-party payments or rent payments from the airport to a developer. If approached properly, this model could result in the least expensive and most time-saving approach, with shorter timeframes for project delivery and startup. However, one concern with the FDBOM approach is that it would likely require a longer-term contract that may fall outside of an airport's procurement guidelines.

### 4.3 Annual Operations and Maintenance Costs

In most US airports, the estimated annual operations cost for a CRDF is around 1–2% of yearly gross concessions revenues (as a rule and highly dependent on scope of services). Correspondingly, many airports assign CRDF charges based on each concessionaire's percentage of gross sales. This approach can be most equitable, with the percentage being higher for F&B concessionaires than for retail concessionaires due to volume of goods and difficulty or frequency of delivery. These charges can generate enough revenue to not only fund the CRDF but also provide surplus revenue to support improvement initiatives that further the effectiveness of CRDF activities. These can include logistics node point improvements at terminals, or inclusion of other ancillary activities such as grease recycling or parcel pickup staging areas at the CRDF.

However, some concessionaires have expressed concerns regarding CRDF charges and the strain on their bottom line, regardless of the benefits of a CRDF in which they share including lower insurance costs, the elimination of tariffs for time-consuming airport deliveries, and streamlined delivery processes. In certain cases, airports have allowed concessionaires to raise prices (usually 2%) to cover these costs when they are sharing in the overall cost of the CRDF. In other cases, airports have broken out responsibility and billed tenants (including non-concessionaire stakeholders) the estimated or documented share of their specific CRDF operating costs; these costs exclude an assessment paid by the airport for airport-specific deliveries.

In recent years, some airports have moved away from earlier models that primarily assessed the concessionaires for annual CRDF O&M costs. Those models did not reflect on the holistic values that a CRDF incorporates in other key areas such as safety, security, operations, sustainability, passenger experience, and overall airport logistics.

At many airports, CRDFs support airport O&M, airline/tenant office supplies, janitorial goods, regulatory tenants (i.e., fire/safety, FAA, TSA, airport law enforcement), airport hotels, airline clubs, strategic parts stores, airport art foundations, armed services centers (e.g., United Service Organization [USO]), and numerous other types of tenants with their logistics needs.

Certain airports are now choosing to pay for CDRF O&M expenses directly, and then allocate those costs to the airport's various cost centers. These costs are then recovered either directly or indirectly by the various airport tenants and rate-setting mechanisms within each cost center. In addition, a portion of the CDRF O&M costs are also allocated to the airport itself for airport services such as recycling, security, and janitorial services.

One large hub airport CRDF allocates 25% of the CDRF O&M expenses to concessionaires, with the remaining 75% of O&M allocated to the airfield cost center, as they view the CRDF as a security function protecting the airfield and improving the overall passenger experience. In a recent CRDF RFP, another airport authority contemplated allocating 100% of the O&M costs to the airport, as they deem the CRDF essential infrastructure that helps the concessionaires operate more efficiently and the airlines more safely, with less interference on the airfield. This approach would seem to consider CRDF operating costs as more of a “utility” cost to be shared by all, as compared to placing the financial burden on the concessionaires. This airport authority feels that CRDF is now mainstay infrastructure and, regardless of the tenant or retail operating partners, all airport operating tenants can expect some support from the CRDF if an airport is aspiring to be best in class.

In the case of another large hub airport, the CRDF O&M costs are allocated to the Common Area Maintenance (CAM) charge that is assessed to concessionaires based on percentage of sales, with the airport also absorbing a share of the costs for the handling of their own products (janitorial supplies, parts, etc.) Also included in this airport’s CAM are costs associated with utilities, pest control, common-use food court cleaning, and other activities.

Additionally, airports utilizing a CRDF will recognize savings in staffing by reducing contract or other security staff, as merchandise inspections are no longer needed at security gates. Utilizing a CRDF-focused cost-allocation approach can assess both savings and costs more equitably.

Various hybrid options exist for covering annual O&M costs that are viewed more favorably by the concessionaires, airline lounges, and other tenant stakeholders. Rolling these costs into per square foot rents has been more common, and is generally more acceptable, for new concessions programs. A listing of how other U.S. airports that have a CRDF assess their O&M charges is included in Appendix E.

## 4.4 Cost Savings for Consideration in Cost Assessment

This section details the cost savings that can be realized from providing a CRDF at an airport.

### 4.4.1 Efficiency

Security savings are realized with the more streamlined inspection process that a CRDF offers. The decreased number of vehicles and inspections at perimeter airfield gates, as well as vehicles traveling on the AOA will free up security staff to focus on higher value issues. Generally, AOA vehicle traffic has been reduced to a third of the original when comparing before and after ramp-traffic volumes.

### 4.4.2 Security

Another benefit provided by the introduction of CRDF operations is a reduction in credentialing office staff time needed for issuing and maintaining security badges (including ongoing SIDA training) for delivery drivers and other concessions staff. Airports that have a CRDF find that they issue far fewer security badges. In one study of a large US hub airport, it was estimated that the number of security badges associated with deliveries could be cut by 95% with the implementation of a CRDF. Plus, cost reductions realized when consolidating multiple checkpoints into one centralized security checkpoint can be substantial, particularly when x-ray screening of goods is mandated.

### 4.4.3 Operations

Implementation of a CRDF results in reduced administrative and staff time associated with maintaining AOA driver’s licenses, escort of delivery vehicles, and enforcement of driving regulations.



#### 4.4.4 Tariffs and Insurance

Insurance requirements burden delivery vendors and concessionaires who operate on the AOA. Required coverage of \$20 million in liability for vehicles is not uncommon. Delivery vendors often charge “tariffs” to their concessionaire customers for difficult delivery locations. These tariffs can be anywhere from 1–5% of the costs of the incoming orders. With the reduction of delivery vendors and concessionaires operating on the AOA, insurance burdens are reduced, and concessionaires can negotiate savings with vendors.

#### 4.4.5 Revenue Generation

Providing “just-in-time” delivery capacity in tandem with integrated secure warehouse storage within the CRDF (especially at airport per square foot rates) can generate additional revenue. CRDFs that function as recycling hubs may generate revenue from collected waste fryer oil if sold for biofuel production. This oil could also be used for an airport’s own purposes in flex-fuel vehicles (in partnership with a biofuel processor).

#### 4.4.6 Sustainability

Reduction in CO<sub>2</sub> emissions and fuel costs are realized through using fewer vehicles for delivery/distribution, lack of queueing at security gates, and up to two-thirds reduction in delivery trips. Greater recovery and recycling of unused or returnable materials can be realized with a professionally managed returns program that is operated through the single collection point of the CRDF. Additionally, the increased capacity of an airport with a CRDF allows for bulk purchasing that can result in cost savings while reducing packaging waste.

## SECTION 5: OPERATIONS AND LOGISTICS

When a CRDF operator is selected, that operator meets with the concessionaires and other airport tenants who will be using the facility to finalize processes, schedules, and delivery procedures for all aspects of the process. While some retail delivery needs can be fairly straightforward, F&B needs can be challenging from an operational standpoint and require physical space and operational adaptations in order to serve the tenants well. F&B tenant deliveries involve attention to FDA requirements, storage, and transportation and handling involving freezers and coolers of frozen and chilled products, and monitoring of temperatures per Hazard Analysis and Critical Control Points (HACCP) standards. Unique products like fresh goods are identified and accommodated. In one case study example, a cooler was built into the non-secure receiving area with direct dock access to comply with sensitive fresh seafood deliveries. Both the inbound and outbound (returns) requirements of each tenant must be understood and refined beyond information identified in the planning phase.

Once the CRDF operator has a clear picture of the delivery, stocking, return logistics, and timing needs of all potential customers, they can build their operating plans.

### 5.1 CRDF Delivery Procedures

The goods handling process includes the following steps:

- Goods are received at the facility via vendor/concessionaire delivery vehicles, generally at a pre-arranged dock time
- The vendor delivery vehicle, delivery time, driver, and bill of lading are checked against the manifest and schedule
- The inbound goods are off-loaded from the vehicle by CRDF staff with assistance from the driver into a non-secure area
- At an access control scanning portal, the received goods undergo screening; this could involve the use of x-ray or trace detection equipment or a manual inspection based on TSA's established security directives
- The screened goods are moved to the secure warehouse portion of the CRDF, and staged for consolidation and delivery to defined destinations within the airport
- The product is picked, sorted logistically, and loaded into CRDF distribution and delivery vehicles (i.e., SDVs; see Section 6.3 for discussion of SDVs).

Each airport's CRDF has unique procedures that meet its specific operational requirements. Features that regularly vary across CRDFs include the types of goods accepted, the types of airport tenants served, and storage capabilities and capacities at the CRDF and terminal. Some CRDFs service only concessionaires and no other airport entities. Only a few have storage capacity for airport tenants. There is no one size fits all solution, but the more vendors and entities that are handled through the CRDF, the more vehicles are removed from the terminal curb (Tellijon 2020).

### 5.2 Developing Operating Plans

Airports generally require their CRDF operator to create operating plans that include a specific Supplier Plan, a CRDF Security Plan (safety-sensitive and needing TSA approval), a Duty-Free Delivery Plan, a Supplier Management Plan, and a Logistics Plan. The compilation of these plans determines CRDF final staffing needs, operating procedures, hours of operation, and equipment needs.

Most large airports that implement a CRDF start the process in incremental steps. It is recommended that overall CRDF goals are set up front and then implemented over time. Generally, most airports start with airport tenant deliveries by individual vendors in a sequence like the following example:

1. Vendor A and B for the first 2 weeks
2. Vendor C in the next 2 weeks, etc.
3. Airport deliveries after 2–3 months etc. until 100% participation is achieved

At start up, recycling programs and grease removal are generally viewed as lower priorities and can be addressed after successful delivery operations have been proven. In some cases, concession leases may be expiring and the previous method of making deliveries can work for a period in conjunction with the new CRDF operator. Other airports have implemented CRDF deliveries for their newer concessions that were developed with appropriate lease language and CRDF participation requirements clearly defined. Concessionaires with expiring leases were not assessed CRDF charges until new agreements were in place.

Operating plans address issues of staffing, assignments, use of equipment, and hours of operation. Most CRDFs open early (in some cases as early as 2:00 a.m.) and take delivery of fresh pastries, newspapers, and other sundry items that need to be in the terminal before customers arrive. Very large CRDFs (London Heathrow, for example) may need to have continuous operations, but U.S. airports have not yet seen that requirement to date. F&B products are more time sensitive and the Logistics Plan assures end users that product will be accepted, screened, and delivered in time to meet their food-preparation needs prior to commencing cooking operations. Retail goods are generally not as time sensitive, and storerooms can be easily stocked ahead of time. Duty free goods have their own CBP requirements and unique handling needs that differ by airport.

The Logistics Plan is often 30–40 pages and serves as an SOP reference for the facility, the staff, and the tenants. Logistics Plans change with tenant needs, and should be considered living documents and updated regularly.

For one case study CRDF, incremental (yearly) milestones for adding and expanding goods handled by the facility enabled the airport to start up the CRDF with basic services, while more complex processes such as Duty Free were added at a later date.

### 5.3 Supplier Management Plan

Delivery vendors often see the greatest benefit from the implementation of a CRDF. At many airports without a CRDF, delivery times and loading dock spaces are commodities managed on a first-come, first-served basis. Drivers and vehicles may be on airport grounds for hours seeking to acquire a space at a loading dock and then to facilitate their deliveries.

With a CRDF, procedures are outlined in the Supplier Management Plan. The Supplier Management Plan defines the needs and organization of the receiving operation and sets up process efficiencies. Plan aspects include:

1. Development and documentation of communication protocols between the suppliers and the CRDF operator.
2. Policies related to guaranteed delivery arrival and quick turnaround times for vendor delivery vehicles. The vehicle and driver can be much more productive, and can serve other customer needs in the community. Furthermore, the vehicles spend considerably less time at the airport

creating exhaust emissions (as much as 97% less time). In unit terminal airports, a delivery might take five stops versus a single stop at the CRDF.

3. Rules regarding dock time compliance. On occasion, vendor dock-time compliance can become a problem, and the CRDF operator must deal with it through counseling or progressive penalties up to and including the refusal of a delivery. Often a 15-minute window on either side of the agreed-upon dock time is offered as a flexible response to traffic and other unpredictable timing issues. Notification may be given by phone that the flexible time may be increased, but if the delivery is off schedule by a pre-established requirement of airport or TSA security guidelines, the delivery may need to be canceled, rescheduled, or may be impacted by an internal security review by the CRDF operator or security personnel. The customer is always brought into these issues so that they can assist and cooperate with the accountability measures.
4. Driver requirements. While there are still security requirements for drivers to meet, including airport and TSA security guidelines and directives, the stipulations are much easier to meet when the drivers are far fewer, known, and more consistent.
5. Recommendations for multiple customer loads to potentially arrive in one larger, precisely timed, consolidated delivery versus several small drops from a multitude of vendors at a variety of times. This increases supplier efficiency and provides the ability to serve even more customers with fewer assets deployed.
6. Material tracking and chain of custody. The use of barcoding or other tracking requirement. Delivery vendors utilize the operator's specific barcode on all incoming pallets, totes, and deliveries. These barcodes populate the CRDF operator records and communicate critical information to the CRDF employees accepting the goods. Information included in barcoding can indicate when and where the goods are needed; if the goods are a "quick shot," needing immediate delivery; or if the goods are scheduled to be consolidated with a later load. In one case, the inclusion of this barcoding technology along with the related IT systems was the difference in a bid that projected the need for 15 employees versus another with an estimated need for 20 employees (at a significantly higher cost).

## 5.4 Building the Schedule

Schedules are built around the tenants' needs for deliveries (times and locations), as well as the ability of the delivery vendor to meet agreed upon-dock times. The term "delivered as promised" is used by one CRDF operator, and refers to a guarantee to the customers that their product will be at a destination location at the exact time it is promised. This minimizes concessionaire/tenant time spent receiving deliveries, and customer-facing time may be enhanced. This can be impacted by a late delivery, but generally the schedule is built with a certain amount of buffer so that the subsequent delivery time is not compromised.

1. Adequate time needs to be scheduled for receiving and screening the goods, the logistical organization of the goods, loading the distribution vehicle, delivery to various terminal node points, and the final movement of the goods to the agreed-upon receiving points.
2. The schedule needs to be periodically reviewed and adjusted for product demand changes, concessionaire or tenant needs, or more effective use of personnel.
3. Holidays are often busier times for concessionaries at airports, and the CRDF operator needs to have an accordingly expanded schedule and capacity to meet customer product needs.

## 5.5 Screening

As noted in Section 3, a primary screening method used in most U.S. CRDF locations is visual and physical inspection as outlined by TSA security directives. This process involves the detection of prohibited items by visually inspecting for signs of tampering and/or alteration. All CRDF reviewed for case studies followed approved TSA inspection methodologies. However, some CRDFs have gone well beyond the minimum standards. Several CRDFs have incorporated into the screening process a special area for final visual inspection, referred to as an “inspection airlock.” The airlock, also called a rejection area, is a fenced area with interlocked doors or gates that allow goods to either be rejected back into receiving or accepted and moved into the secure warehouse. The doors should be electronically controlled and interlocked so that both cannot be opened at the same time. Other inspection overlays to the above methods include x-ray screening (recommended to be a unit large enough to accept a pallet of goods) or ETD. Please reference Section 3 for further details.

## 5.6 The Logistics Plan

The Logistics Plan defines the time of delivery to various terminal storage or airport tenant locations. At CRDFs, distribution delivery vehicles are loaded with a first-in/last-out order of delivery based on the schedule. Though some deliveries may be emergency “hot shots,” and require immediate delivery to a location that has run out of product, most deliveries follow the agreed upon priorities and times that are set up in the plan. If hot shots occur with regularity, it is often due to a lack of planning by the airport tenant and corrective action is required. Usually, a fact-based discussion between the CRDF operator and the tenant solves these problems, but occasionally the airport may be invited to help facilitate a solution. Like the schedule, the Logistics Plan is an area that needs strict implementation guidelines according to need, and continuous review and improvement.

## 5.7 Sustainability

Opportunities to implement or increase the effectiveness of airport sustainability initiatives can be found through the aggregation of returns and recovery through a CRDF. Reusable packaging, including plastic pallets, cardboard containers, totes, and beverage kegs can be managed through the CRDF returns process. Food waste, such as grease, can be consolidated at the CRDF and disposed of or recycled. Food products that pass a sell-by date can be collected and distributed by the CRDF through food recovery programs both on and off the airport campus. As noted in Section 5.9, compliance with existing recycling programs can be enhanced by the CRDF process.

## 5.8 Timely Delivery and Reverse Logistics

Deliveries from the CRDF operator to the end user are scheduled and tracked. Concessionaires know that at a certain time they should expect a delivery and handoff at either a retail store, F&B location, or their back-of-house storage or commissary location. Improving delivery times removes uncertainty and time-consuming coordination for transfer of goods. Tracking of goods can increase compliance with tenant acceptance procedures, reducing the chances of misplaced goods and non-compliance with HACCP standards.

CRDF operators are generally responsible for the collection of return items like empty kegs, CO2 containers, soiled linens, and food trays. Furthermore, airports also generally assign responsibility for the return of pallets, cardboard, and plastics (once consolidated by the tenants) associated with deliveries to the CRDF operator. This is an efficient and reliable approach to a potentially troublesome enforcement issue of tenant compliance with an airport’s recycling guidelines.

Certain products may not be able to be used and are returned to suppliers, such as mis-shipped items, food-quality rejected goods, or defective goods. Damaged items may require returns to the vendor. The CRDF should be able to provide a process to handle such requests. UPS and FedEx deliveries are often facilitated by CRDF operators, while return parcel mailings may be brought back to the CRDF for transfer back to the shipping handler. U.S. Mail was not included in any surveyed CRDF duties.

Many airports encourage F&B concessionaires to participate in food bank or food recovery programs. However, it is not always practical for individual concessionaires to gather edible but nonsalable food for pickup or distribution. Several airports have assigned the CRDF operator with the responsibility to bring this type of food product back to a central location for pickup, or even to deliver to a community food bank or distribution center. A CRDF can support and enhance community food bank programs.

The collection and recycling of used cooking grease is often messy, and usually handled by sending liquid vacuum trucks to various airport collection points. Some airports have assigned collection to the CRDF operator. Concessions areas are outfitted with specialized transfer containers that are transported by the distribution vehicle back to the CRDF where the product can be efficiently collected by one vendor truck. This approach facilitates a more professional handling of a challenging product. CRDF grease collection programs effectively eliminate the need for liquid vacuum trucks on the AOA to gather used cooking oil from various collection receptacles or individual concessionaires in a piecemeal fashion.

## 5.9 Food Protection

As previously noted, protocols for food protection differ from retail and other goods in terms of timing, FDA requirements, storage, transportation involving freezers, coolers, and the monitoring of temperatures per HACCP standards. CRDFs are well-positioned to implement existing and future safety regulations for incoming goods.

## 5.10 Tracking and Reporting

Airports can require that the movement of goods through a CRDF be tracked and documented by electronic methods. Just like a FedEx or Amazon order, suppliers, customers, and in many cases airport staff expect to be notified of when product arrives and what stage of the CRDF process it is in. Tracking of temperature compliance is critical, and adequate records must be kept to document compliance with food safety regulations. To meet this need, many CRDF operators have developed custom software solutions for tracking and communication.



## SECTION 6: ARCHITECTURAL AND ENGINEERING DESIGN

The design process to create a CRDF integrates security, budget, function, and operations. Configuring the required CRDF program into a new or renovated building requires a team of consultants with knowledge of both landside and airside operations at an airport. This section will focus on elements of the design process for a CRDF building and site.

### 6.1 Stakeholder Engagement

Design and construction of the CRDF is an intense part of the process where communication is critical. Ideally, the A/E team that was part of the planning process can continue on through design and construction. This is helpful but not necessary.

For the owner and airport team, identifying a core management group to participate throughout the design and construction process is key. These stakeholders will need knowledge of concessions, security, and operations at the airport. They will participate in the design process, and work with consultants to ensure the CRDF meets the airports needs, is delivered on time, and on budget, as well as guide the facility from planning into operations.

Other stakeholders that should be part of design include airport law enforcement, airport fire department, airside operations, building code officials, concessions developer or operator, and vendors with goods that will pass through the facility.

The A/E team will include an architect as lead, as well as consultants responsible for mechanical, electrical, security, and specialty systems. The A/E team—whether working directly for the airport or on a team under a CRDF operator providing a turn-key facility—will follow a typical design process to create construction documents and support construction. As a part of this process, they may utilize interviews, workshops, tours, and other interactive sessions to assist the owner in engaging stakeholders.

### 6.2 Site and Building

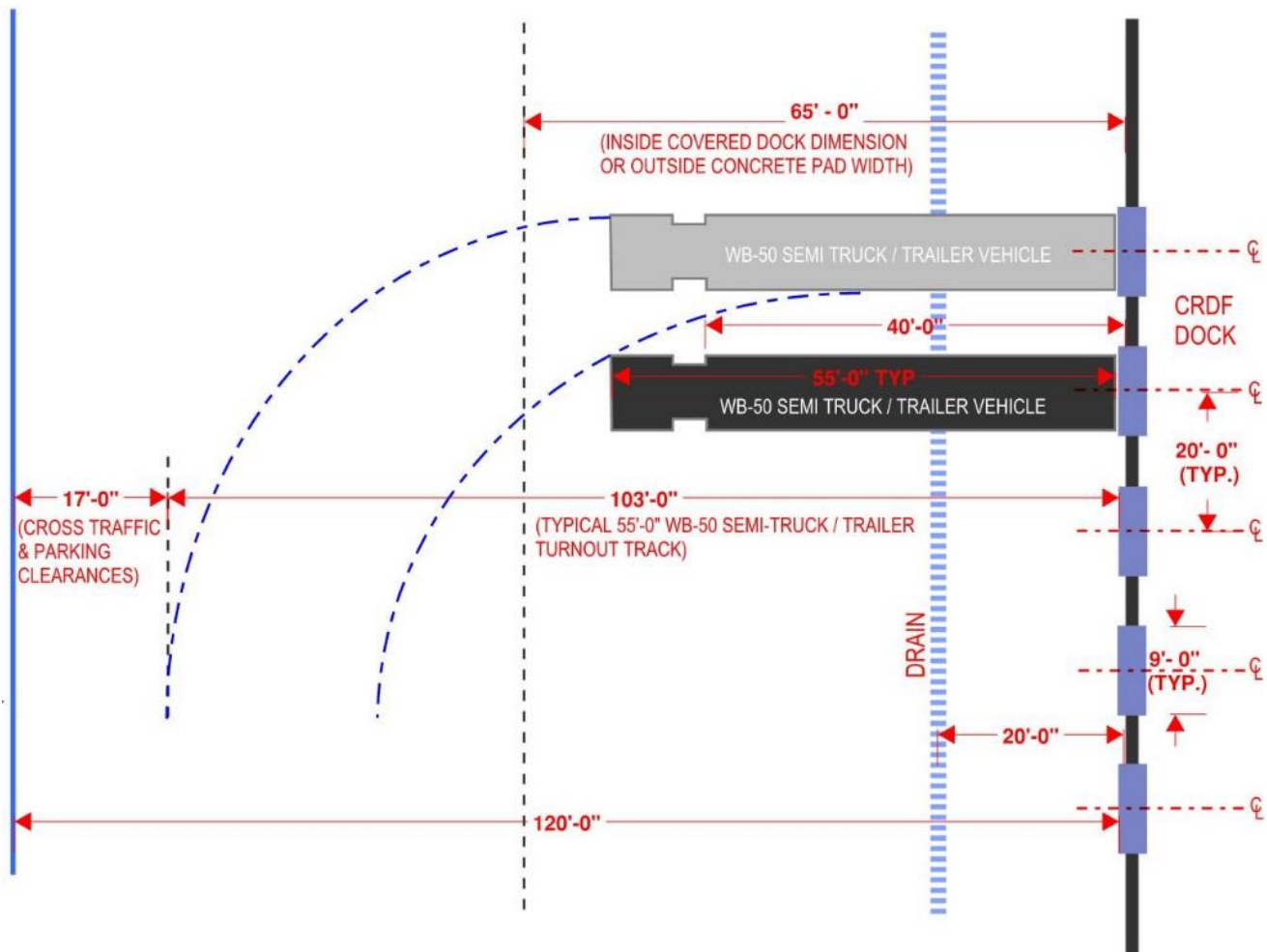
#### 6.2.1 Exterior Conditions

A CRDF site must include delivery vehicle staging and dock approach areas, dock parking areas, employee parking areas, and secure distribution vehicle parking. When a straddle configuration on airport property is used, distribution vehicle dock approach areas will interface with airfield roadways. Because of the variety of delivery vehicle sizes and door heights, grade changes between dock parking areas often require exterior stairs or ramping.

As with any facility with significant vehicle traffic, impervious pavement is the predominant surface. Within large paved areas, management of site water and runoff—as well as snow and snow storage—is a significant consideration. On constrained sites, vehicle movement to access docks can be accommodated more easily with sawtooth dock configurations. However, straight docks optimize interior space (Freese, 2000). Figure 6-1 shows a plan for a typical straight dock configuration.



Figure 6-1 Dock Apron Diagram – Plan View



Source: U.S. Army Corps of Engineers, Naval Facilities Engineering Command, & Air Force Civil Engineer Center, 2019

### 6.2.2 New Construction or Renovation

Following site selection, the second largest influence on the configuration of a CRDF is if the building is new construction or renovation of an existing building. New construction allows for optimal space configuration and a higher performance building than is typically possible with renovation. This is because new construction can utilize state-of-the-art construction methods and materials. However, because it requires the creation of a complete building envelope, new construction often requires more capital investment.

If a CRDF is designed to utilize an existing building, costs of construction are reduced because the building is already enclosed and loading docks are often existing. Other advantages of creating a CRDF by renovating an existing building include reuse of underutilized buildings controlled or owned by the airport, and the opportunity to lease a space to quickly develop a CRDF.

### 6.2.3 Enclosure, Structure, and Materials

Shaped around the warehouse function, typical CRDF buildings need large volume spaces with open floor areas. Longspan structural members such as steel trusses or precast concrete beams are needed to create these types of spaces. Height required within the warehouse is determined by storage needs and

duration of storage. With many goods remaining at the CRDF for less than 24 hours, high-bay space with tall racking is not a necessity; however many CRDFs are built to accommodate high-bay storage in the future.

Materials used for floors and walls within a CRDF must be very durable to resist damage from goods movement and equipment. Even with durable materials, guards like bollards to further reduce wear and impacts at openings and walls are recommended. In addition to being durable, material and finishes also need to also be cleanable. With the handling of foods and beverages comes occasional spills and breakage. Cleanable surfaces like epoxy-coated floors and painted concrete masonry unit (CMU) walls are easier to maintain than concrete and metal mesh.

#### 6.2.4 Circulation, Signage, and Wayfinding

As noted in the planning and operations sections, efficiency in the flow of goods through the CRDF must be considered early in the layout of the facility. Case studies of six CRDF locations included both renovation and new construction, with two locations (both renovation) having docks configured on the same side of the building, and four having docks on opposite sides. Researchers noted that plan configurations that require goods to turn 90 degrees at some point in the process introduce the potential for congestion as goods move past each other. Plan layouts should closely examine flow paths and reduce or eliminate 90-degree turns.

Another strategy to reduce congestion at the receiving area was referred to by one operator as “keeping vendors in their box.” This location recommended active management of vendors within the receiving area by painting lines on the floor to prevent goods mixing. Painted lines coupled with suspended signage can also aid staff in sorting goods on the warehouse floor for multiple delivery points or concessionaires.

### 6.3 Systems and Equipment

#### 6.3.1 Mechanical Considerations

CRDF facilities are primarily a warehouse and include numerous large doors. With doors frequently opening and closing, mechanical system design must consider regional climate conditions to maintain an environment appropriate to the goods handled and staff comfort. In northern climates, heating loads drive envelope and mechanical system design, and can result in opaque walls separating receiving docks and the secure warehouse. In southern climates, cooling loads dominate, and mesh partitions to enable air movement are prevalent. In high humidity and coastal climates, designers should consider staff comfort and include air conditioning.

#### 6.3.2 Electrical Considerations

The electrical needs of a CRDF include power to handle warehouse functions such as coolers and freezers, dock lifts and doors, heating and cooling equipment, and high-bay lighting. Like many airport facilities performing a security function, back-up power in the form of a generator or other redundancy protects the facility. Equipment for handling goods can be electric or natural gas powered. If gas powered, ventilation needs must be addressed.

### 6.3.3 Equipment

The majority of equipment used at a CRDF is neither unique to the facility nor specialized for CRDF use. Loading dock equipment such as dock levelers, dock lighting, and dock seals are common throughout the cargo handling industry, with many types and options available to suit specific building or environmental needs. Vertical storing levelers, for example, allow more complete closure of the dock opening when not in use, minimizing energy use and reducing the potential for pest entry. Secondary dock doors with screens allow doors to be open in temperate months for ventilation while keeping birds out.

Pallet trucks, forklifts, and other goods-handling equipment will be sized according to the facility and needs of the operator. Utilizing electric handling equipment is recommended for indoor air quality. Duplicate equipment should be provided on each side of the secure portal to preserve sterile conditions. Provision for charging of electric handling equipment should be made where this equipment is used.

SDVs that transport goods from the CRDF to the terminal are typically small to mid-sized box trucks. The quantity and size of the SDV fleet are determined by the operational needs of the facility. For CRDFs located in adjacent or straddle relationships with the airfield, the distance traveled to and from the terminal can be limited, presenting an opportunity for electric vehicles to be utilized. One case study location in a northern climate noted that the short distances traveled have caused issues with diesel engines in very cold weather. For this and similar reasons, climate should be a consideration when determining the CRDF fleet mix. Regardless of location, fueling or charging of SDVs should be considered with the design and operations plan for the CRDF.

See Section 3 for discussion of goods and employee screening equipment, cameras, and other security components.

## 6.4 Design

### 6.4.1 Airport Design Standards

Because of their important role in interfacing with vendors, CRDFs offer an opportunity for airports to reinforce their brand to the public and customers. This is especially true with new construction projects.

Many airports utilize a documented design standard for facilities constructed on airport property. These standards guide the physical and performance aspects of design and architecture. While not a terminal or publicly accessible building, airports should consider application of design standards in their CRDF to enhance the campus environment.

### 6.4.2 High Performance Design

In addition to airport specific standards, many jurisdictions and airports require new buildings to perform at a level greater than code minimum for energy use and other environmental factors. During the early phase of design, criteria for building performance should be codified and considered in the budget. Using nationally recognized guidance criteria like United States Green Building Council LEED standards can streamline the definition of building performance and provide a common reference for a non-local design team. Capital investment in high performance construction directly impacts operational costs by reducing energy use, reducing maintenance costs, and increasing the lifespan of building materials and systems.

### 6.4.3 Human Factors in Design

As a labor-intensive effort, sorting, managing, and moving goods within the CRDF requires appropriate training, and a safe and comfortable working environment. Dock safety training required by OSHA and additional training specific to warehouse equipment is warranted. Surfaces must be managed, especially in snowy climates, to eliminate water and slip hazards. Personal comfort for heat or cold is important to overall staff satisfaction. Increasing access to daylight in warehouse spaces can benefit occupant wellness by providing a connection to the changing light levels and patterns throughout the day.

## 6.5 Case Study Highlights

The research team examined planning, development, and operations at six existing CRDF locations. The full case studies can be found in Appendix B. Highlights are included below.

- A CRDF can be implemented at a relatively low cost by utilizing an existing building.
- Occupant comfort within the warehouse is important.
- Delivery-mode flexibility can be improved by accommodating multiple vehicle types at the receiving dock—including walk-up person doors and at-grade doors with ramps.
- Locating the CRDF at a remote airfield location with low vehicle traffic accommodates better truck access and more economical parking for staff.
- Due to modern building and energy codes, ground-up, stand-alone buildings in a northern climate will have higher development costs relative to development of an existing building in the same climate.
- Investigate vertical storing dock levelers to improve energy performance.
- Sites should consider a truck stand-by area for vendors arriving early or late for their scheduled delivery.
- Rotating secure screening portals 90 degrees allows goods to feed into a rejection portal, adding an option to remove goods following screening, before they enter the secure warehouse
- Ensure involvement with the right stakeholders from the start, including operations, finance, security and capital programs.
- Proposers responding to Operational RFPs should understand the TSA rules for delivery to Sterile Areas.
- Ensure proper wages upfront for consistent staffing and to avoid turnover. Competition for drivers with other providers can make employee retention difficult.
- Community outreach is extremely important for remote sites due to additional truck traffic on local street routes.
- Remain flexible/open in working with existing concessionaires.
- Utilize a phased implementation approach to allow for existing tenant leases to expire; it is more difficult to change everything overnight.
- Duty free goods require collaboration with CBP early on in the bonded goods process.
- Terminal/Concourse storage should be considered in conjunction with CRDF implementation to ensure airside storage units are built into new terminal projects, as tenants need a place to store goods once deliveries are made.
- Consider non-secure coolers/freezers for locations with significant fresh food deliveries (e.g., seafood).

- Additional floor space in the receiving area should be considered when a multiple (over 4) receiving dock doors are utilized, to avoid congestion at the secure screening portal.
- Configuring support spaces with glass walls facing the receiving and secure warehouse area enables increased monitoring of the floor by managerial staff

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## APPENDIX A: KEY DECISIONS CHECKLIST

### Planning Checklist

- Review benefits recognized from airports with CRDFs
- Determine unique airport needs and relative importance of each aspect of a CRDF
- Identify an internal airport team, champions, and key stakeholders
- Engage team for planning process through RFP or other procurement
- Develop a Needs Evaluation for the CRDF
- Initiate Security Checklist (see Section 3)
- Determine project delivery method and initiate Finance Checklist (see Section 4)
  - Will inform next steps if delivery is by operator (PPP)
- Develop the Project Budget
- Identify Design Project Management Team – the airport is involved even if the project is turn-key by a CRDF Operator or Concessions Vendor
- Initiate Operations Checklist (see Section 5)
- Coordinate and communicate with stakeholders to solicit feedback on needs, desires, quantities, and adjacencies
- Identify programmatic elements and square footage required based on needs and operational model
- Identify potential CRDF locations: on-airfield-fence and remote site options, new building or building reuse options
- Initiate Architectural and Engineering Design Checklist (see Section 6)
- Develop a building concept plan that aligns with the program, maps out circulation flows of people and goods
- Refine the Project Budget
- Develop consensus regarding the Concept Plan amongst stakeholders
- Move into final design with minimal changes

### Security Checklist

- Conduct vulnerability assessment of current concession-related operations (See [PARAS 0016 – Airport Security Vulnerability Assessments](#))
- Perform an inventory of facilities and personnel involved in the movement of concession materials
- Investigate existing security policies of airport badge holder populations (i.e., concessionaire SOPs)
- Define security benefits derived from CRDF consolidation
- Evaluate existing security assets (CCTV, bollards, access control) that are part of or adjacent to proposed CRDF operations
- Examine surrounding community for off-site CRDF locations
- Assess loading dock options relative to concession volumes and anticipated deliveries
- Develop a Security Plan for CRDF

## Finance Checklist

- Review concessionaires' leases. Is language included that requires financial contribution to a CRDF if one is implemented by the airport? Inclusion of like language in any upcoming concessionaire leases or bids is recommended.
- Review the desired functions of the CRDF, including ancillary components such as grease handling, other airport tenants, additional retail storage, commissary needs, food bank etc.
- Develop and issue Operations RFP and select CRDF operator
- Determine project Delivery Model and Capital Program
- Determine means of covering annual O&M costs.
- Continue stakeholder communications: airlines, concessions, airline operations, security, sustainability
- Conduct site selection and site acquisition
- Develop and issue Design and Construction RFP and select design team

## Operations and Logistics Checklist

- Consider organizational consolidation
- Consider timely delivery and reverse logistics
- Develop operating plans
- Identify customer needs
- Coordinate with delivery vendors
- Develop the delivery schedule
- Define screening procedures
- Develop tracking/reporting procedures
- Develop receiving procedures

## Architectural and Engineering Design Checklist

- Develop and document building program (see Section 2)
- Execute design and construction
  - Develop a preliminary budget for the project (design and construction of the facility including all required infrastructure).
  - Develop design documents (Architectural, Structural, MEP, Civil, special systems, etc.) for bidding and construction of the project.
  - Assist airport administration in the preparation of bid documents for construction
  - Provide construction management services during construction
- Initiate transition of receiving from terminal to CRDF
- Conduct initial operations and post occupancy evaluation
- Expand operations to include other goods, such as Duty Free
- Renovate and expand facility to upgrade equipment or to add capacity or services

## APPENDIX B: CASE STUDIES

The research team examined planning, development and operations at six existing CRDF locations, described below. The results include information from visits and follow-up interviews, layout diagrams, and images. A supplemental assessment in a tabletop format was also conducted for the CRDF locations numbered 4–6.

1. Northeastern U.S. Large Hub Airport
2. Southeastern U.S. Small Hub Airport
3. Midwestern U.S. Large Hub Airport
4. South-Central U.S. Medium Hub Airport
5. Western U.S. Large Hub Airport
6. Southeastern U.S. Large Hub Airport

## Case Study 1: Northeastern U.S. Large Hub Airport

### CLIMATE ZONE 5

#### OWNER/DEVELOPER/OPERATOR

<b>Owner</b>	Airport
<b>Developer</b>	MarketPlace
<b>Operator</b>	Third Party
<b>Staffing and Employer(s)</b>	30 staff/day on shift typically; only 20 staff on Saturdays; must have airport badge to work in the facility

#### PROJECT IMPLEMENTATION

<b>Date Operational</b>	October 2018; voluntary enhanced screening commenced in January 2020
<b>Previous Screening Location and Method</b>	Vendor delivery trucks at various terminal building landside curb fronts. This resulted in congestion on the curb fronts and landside roadways. The vendor then brought the goods to the passenger checkpoint for screening and delivery to Sterile Area concessionaires.
<b>Drivers for CRDF</b>	Reduce congestion on landside roadways/curb fronts, enhance security
<b>Implementation Process</b>	Entire process was a total of approximately 2 years from start to finish, including planning and construction
<b>Operations Funding Source</b>	25% of the charges assessed to concessionaires and 75% assessed to the airfield cost center (i.e., airline rates and charges), as this approach protects the airfield and bought back roadway capacity by removing 550 commercial vehicles per day from the public roadway, improving passenger experience

#### GENERAL OPERATIONS

<b>Yearly Operating Cost</b>	Unavailable
<b>Terminal Delivery Locations</b>	Delivery is made through the AOA gate to the secure terminal node; minimal storage is provided at each node location
<b>Hours of Operation</b>	3:00 a.m.–11:00 a.m. (Peak is 6:30 a.m.–10:00 a.m.)
<b>General Goods Handled/Returns</b>	Food, beverage, retail deliveries, return of kegs, linens

#### BUILDING INFORMATION

<b>New/Remodel/Other</b>	Remodeled; former freight warehouse facility
<b>Square Footage</b>	Approximately 25,000 sf
<b>Receiving Dock Doors Quantity</b>	Total of 9: 6 overhead high lift doors, and 3 overhead high lift doors directly from exterior to chilled storage
<b>Distribution Dock Doors Quantity</b>	7 overhead high lift doors (2 on north side and 5 on south side) The CRDF has 7 secure trucks, therefore 7 doors is currently sufficient; the relationship between secure trucks and loading doors is ideally 1:1
<b>Receiving Area</b>	Approximately 5,000 sf
<b>Warehouse Area</b>	Approximately 8,000 sf

<b>Expansion Potential</b>	Expand to the north of the existing facility
<b>Location to AOA Line</b>	Remote
<b>Demising Wall Type</b>	Mesh chain link to 10 feet with mesh net to structure above
<b>CRDF EQUIPMENT</b>	
<b>Refrigerator Size</b>	3,000 sf secure; 2,000 sf non-secure
<b>Freezer Size</b>	2,000 sf secure
<b>Movement of Goods</b>	Pallet jack, “U-boat” (a custom cart that was fabricated for the CRDF operator for use in narrow hallways and delivery paths)
<b>Delivery Vehicles</b>	Box trucks (7)

#### **BUILDING SYSTEMS**

<b>Heating</b>	Yes
<b>Cooling</b>	Yes
<b>Electrical Service</b>	Yes

#### **GOODS RECEIVING, SCREENING, DISTRIBUTION/RETURN**

##### **Receiving & Sortation**

Individual vendor/concessionaire trucks park at receiving doors, arriving from the 5–6 primary concessionaire warehouses/commissaries located nearby.

Dry-goods are delivered to one of the six dock doors; cold goods are delivered to one of 3 doors that lead directly to the non-secure receiving coolers. This was noted as important due to the large amount of local seafood for the terminal restaurants.

In some cases, goods are consolidated into pallets or U-Boats prior to screening. Non-pallets are transported via U-boats. This facility has 40 U-boats, which was noted as not an ideal device due to its design. A U-boat carries half a pallet worth of product and has one large wheel in the middle and 2 smaller on the outside. It can be difficult to physically push a full U-boat, and it is not easy to make turns. The facility processes 500–600 U-boats per day.

Each U-boat or pallet has a warehouse ID for tracking purposes. The vendor brings the goods to the CRDF where it is scanned and given the ID.

It was noted that the receiving/sortation area can be congested during peak periods; therefore, the floor has been painted to separate the vendors.

##### **Screening**

Goods are screened in two different ways:

###### 1) Screening Equipment

- Around 30% of the goods are electronically screened, primarily through x-ray screening equipment, with a small portion also using trace detection.
- The equipment is one Rapiscan 632 DV, which was installed in July 2019 and launched in January 2020. This equipment was paid for by airport and installed overnight.
- Entire screening process takes 3 minutes per pallet or U-Boat. This includes the return of the jig that moves the pallet/U-Boat through the Rapiscan unit. It takes no more than 1 minute to look at the scanned image.

- The screening equipment is looking for items on the TSA prohibited items list, and focuses on looking between goods and under U-Boats to ensure nothing is hidden.
- Currently, only around 20 full pallets that arrive at the CRDF facility per day can go directly in the screening equipment.
- Also have an Ionized Scanner for trace detection to swab items from warehouses.

## 2) Manual Inspection

- 70% of goods are screened manually and moved to the secure area via an airlock vestibule with keypad.

## Delivery

Once the goods are screened, they are either taken to the dock doors for placement on the delivery truck or for temporary storage, either with dry goods or in the secure freezer/cooler.

The facility includes seven dedicated airside delivery trucks, including five full-size trucks and two smaller trucks that include refrigeration. The trucks are geofenced and can only travel on certain routes. If the trucks deviate from the route, they will be flagged and denied entry into the airside AOA gate. The airport has two airside gate portals for access.

Deliveries are all scheduled to the terminal nodes. The schedule and delivery driver are cleared ahead of time, and if a truck is not on the list, it is denied access. Once the truck is cleared to access the AOA, the goods are delivered to the 8 terminal nodes.

## Returns Gathered at Terminal

Beverage and pallet returns are stored in the airside warehouse until consolidated for pickup. Returns exit the warehouse through a designated vendor return portal to receiving docks and are loaded.

The facility includes a location for dropping used linens from the concessionaire or airline lounges with easy method of dirty pickup, using rolling carts.

## STAFF SCREENING/MONITORING

All employees and visitors must be screened prior to accessing the facility. At the front-door lobby of the facility, there is a walkthrough magnetometer and table to pass personal belongings. The person who opens the facility screens their self with the magnetometer on camera upon arrival. Staff who follow are screened by the opener. Staff on airside must be screened and rescreened if leaving the secure area. There is an additional walkthrough magnetometer within the facility for access directly to the airside warehouse. Receiving is monitored through a glass wall by personnel inside the management office.

## SECURITY/ACCESS CONTROL

- TSA cameras
- Operator cameras
- Keycard access at many secure doors
- Keyed access at high value storage
- Full CCTV across the facility; including on the trucks



## ADMINISTRATION

The facility includes an administration area between the front security portal and the receiving area that includes:

- Conference room
- Airport Manager office
- Site Officer office
- Breakroom
- Restrooms
- Open congregational area (can fit up to 40 people)

## OTHER

- Duty Free – Coordinated at the CRDF. Processed in ICE facility 100 yards away, goes through screening at CRDF, and is then bonded by ICE at the CRDF facility. ICE bond staff oversee the entire process.
- Signage – All areas of the CRDF are organized by terminal node with signage
- Future Goals – Recycling program, food donation program, pallet return, grease removal
- Logistics are managed via the operator’s proprietary software

## NOTABLE ATTRIBUTES

- Decreased congestion/truck traffic on landside roadways
  - Previously, it was common for trucks to idle for up to 45 minutes on the landside roadway, which also resulted in sustainability/emission issues.
  - Previously, every delivery took at least two vendor employees, with one to stay with the truck on the roadway and one to facilitate the delivery through the security checkpoint. Deliveries to the CRDF can now be facilitated by one driver.
  - Transportation Network Companies (TNC) vehicles (i.e., Uber, Lyft, or other app-based ride sharing) were also increasing vehicle traffic on the roadway, making it even more important to get delivery trucks off the loop.
- Safety
  - Trucks no longer mixing with passenger vehicles
- Efficiency and reliability
  - Reduced overall time per trip
  - Allows for scheduled deliveries to terminal nodes
  - Allows for cased deliveries to the terminal nodes as opposed to half pallets
- Security
  - Reduced vehicles on the inbound and landside roadways and curbside – previously up to 550 vendor delivery vehicle trips per day
  - Central location for screening helps to ensure security reliability
  - Previously, many vendors used Amazon and other combined purchase and delivery vendors that source goods from multiple suppliers; these vendors had issues with Known Shipper protocol as there was not enough security in place
  - Chain of custody for products is now in place that can better identify where they came from (similar process to cargo)

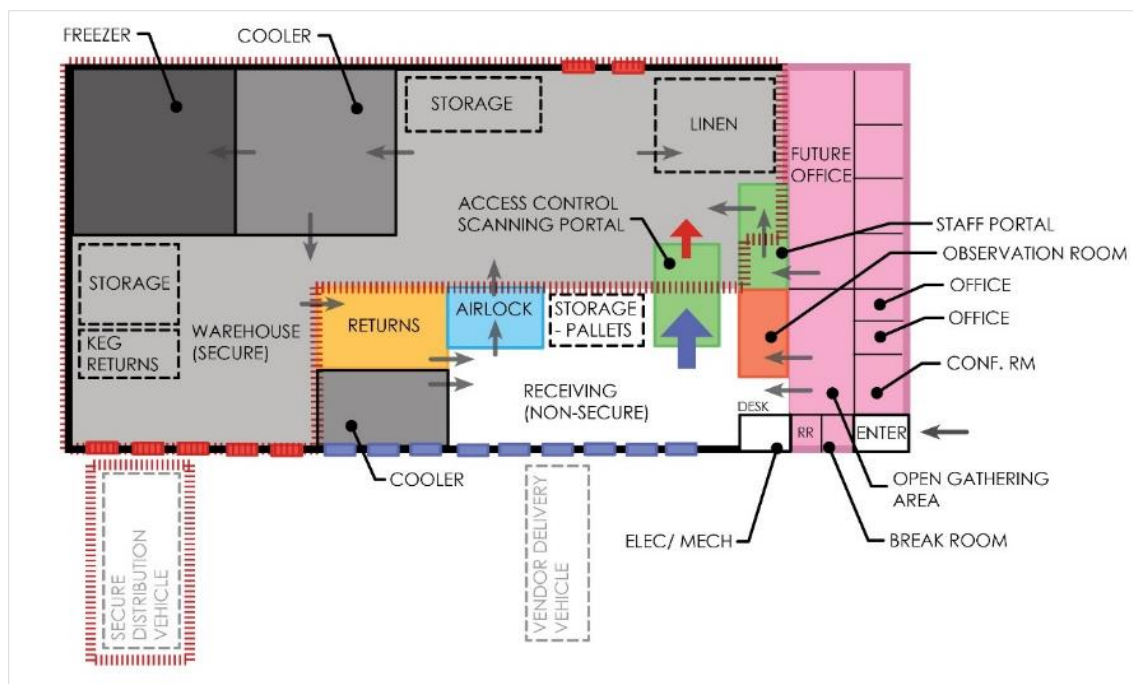
- Drivers are precleared at the CRDF, allowing for fewer AOA badges and driver's licenses to be issued
- Allows for layered security as it keeps logistics and sortation offsite, and does not impact the passenger area
- Terminal Efficiencies/Maintenance
  - Previously, the terminal was taking excessive abuse due to varied concessionaire delivery drivers unfamiliar with the facility hitting walls/elevators with carts and pallets
- Full screening utilizing x-ray equipment was noted by the CRDF operator as being more expensive than hand screening
- Renovating an existing facility for use as the CRDF limited the efficiency of the movement pattern inside the warehouse. Turns and movement of pallet trucks can be tight, and not as ideal as could have been enabled at a greenfield-site building.
- Path of travel to the airside AOA gate can take up to 15 minutes, even though it is around ½ mile away. One traffic light along the return to the CRDF path occasionally adds 7 minutes to the total duration.
- Initial staffing turnover issues due to low initial wages for CRDF employees

## LESSONS LEARNED

- RFP/Procurement Process
  - During the RFP procurement, ensure involvement with the right stakeholders from the start, including operations, finance, security, and capital programs
  - Ensure tight RFP language to avoid issues in operation
  - Ensure that the FSD is heavily involved with the process, and maintain a positive relationship as the facility moves into operation
  - Benchmark other facilities as part of the process
  - Proposers responding to Operational RFPs should understand the TSA rules for delivery to Sterile Areas
- Employees
  - Salary/Rates – Ensure proper wages upfront for consistent staffing and to avoid turnover. The airport had initial difficulty hiring drivers and staff as the wage structure was too low and needed to be enhanced due to competition from nearby companies (Amazon, etc.), and the need for enhanced security and background checks.
  - Initially did not have enough staff due to the salary/wage issue.
  - Identify employees early but do not actively recruit from the concessionaires/vendors to avoid conflict of interest.
  - Include proper training for all employees.
- Community outreach is extremely important due to additional truck traffic on local street routes.
- Geofence on the vehicles/trucks for enhanced security
- Must remain flexible/open in working with existing concessionaires. Utilize a phased implementation approach to allow for existing leases to expire. It is more difficult to change everything overnight.
- Duty Free – Collaborate with CBP early on the bonded goods process. It took over a year to get approval for bonded items at this airport, so this needs to be discussed and figured out well in advance.

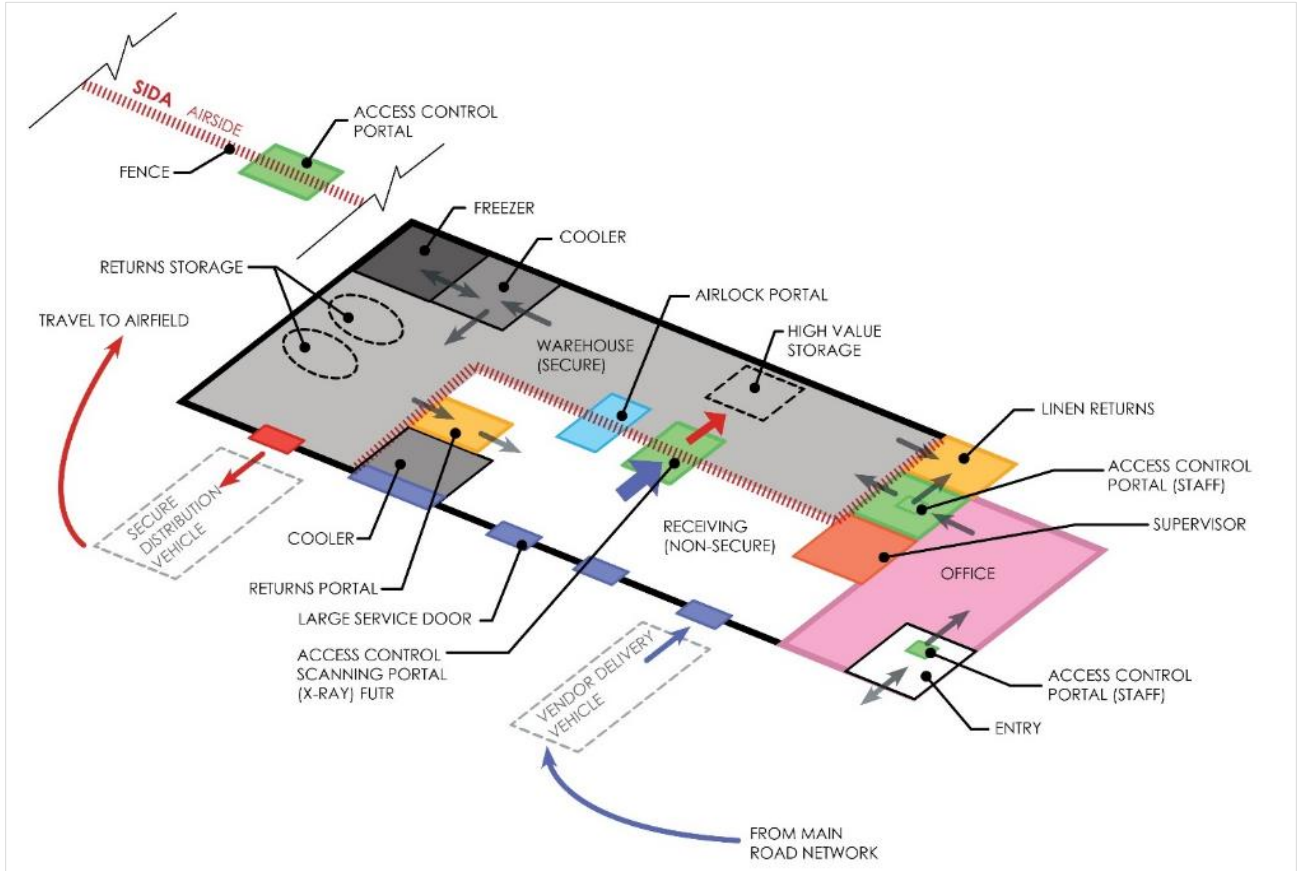
- Building Layout
  - Ideal facility would not have 90 degree turns in the goods movement path.
  - Keep the vendors/concessionaires inside their “box” at the receiving door. The airport put paint on the floor to organize vendors and ensure goods do not mix with each other.
- Timing of deliveries – this location utilizes carts instead of pallets due to lack of width in concourses. This created an issue of needing to get the carts returned from the terminal. Too many linger at the terminal, and a process is needed to get them returned more promptly.
- A Contingency Plan for CRDF startup should be in place to ensure operations are not impacted by construction-related issues or other unforeseen challenges.
- Terminal/Concourse Storage – Ensure airside storage units are built into new terminal projects, as tenants need a place to store goods once deliveries are made.
- Importance of communication – Need to have the vendors understand the impacts of a CRDF (e.g., faster delivery, staffing changes, financial implications)
- Just-in-time product – improved logistic management has helped to ensure that outputs have enough products
- TSA will test/inspect the process and try to breach the system. Need to ensure there is proper training in place to avoid TSA violations.

Figure B-1. Case Study 1: CRDF Plan



Source: Miller Dunwiddie

Figure B-2. Case Study 1: Type B-1 (Remote/Adjacent) CRDF Configuration



Source: Miller Dunwiddie

Figure B-3. Case Study 1: Carts Used for Goods



Source: Landrum & Brown



**Figure B-4. Case Study 1: Receiving and Screening Portal**

Source: Landrum & Brown

Sortation and cart storage in center; goods screening equipment on right; manual screening and airside airlock in background

**Figure B-5. Case Study 1: Screening Equipment**

Source: Landrum & Brown

Screening workstation on right; pallet jack on left side to raise the goods into the screener; 10-foot metal screen divider at the security division

**Figure B-6. Case Study 1: Logistics Center**



Source: Landrum & Brown  
Located at screening/sortation

**Figure B-7. Case Study 1: Cooler and Freezer in Warehouse**



Source: Landrum & Brown



**Figure B-8. Case Study 1: Returns in Warehouse Cooler**



Source: Landrum & Brown

**Figure B-9. Case Study 1: Distribution Doors from Interior**



Source: Landrum & Brown



**Figure B-10. Case Study 1: Returns**

Source: Landrum & Brown

Storage including empty beverage kegs on left and pallets on the right

**Figure B-11. Case Study 1: Linens Receiving Area**

Source: Landrum & Brown

Terminal receiving/distribution doors on the left; Employee screening portal door shown on right

Figure B-12. Case Study 1: Staff Screening Portal



Source: Landrum & Brown  
From interior (secure) side

## Case Study 2: Southeastern U.S. Small Hub Airport

### CLIMATE ZONE 3

#### OWNER/OPERATOR

<b>Owner</b>	Airport
<b>Operator</b>	Third Party
<b>Staffing and Employer(s)</b>	7 staff working for operator

#### PROJECT IMPLEMENTATION

<b>Operator Solicitation</b>	RFP published in December 2015
<b>Date Operational</b>	July 6, 2017
<b>Previous Screening Location and Method</b>	Delivery trucks at terminal building front curb, or delivery trucks airside with airport operations or police escort. Deliveries were by tenant or concessionaire.
<b>Funding Source</b>	Terminal lease agreements with tenants and concessionaires

#### GENERAL OPERATIONS

<b>Yearly Operating Cost</b>	\$500k – \$1M
<b>Terminal Delivery Locations</b>	Five locations, most have storage
<b>Hours of Operation</b>	Varies
<b>General Goods Handled/Returns</b>	Fresh, frozen, and dry packaged food products; beverages; retail deliveries; office supplies; FedEx; UPS; return of kegs, outdated magazines, and food service grease collection

#### BUILDING INFORMATION

<b>New/Remodel/Other</b>	Remodeled South Cargo Building, formerly used by UPS
<b>Square Footage</b>	13,700 sf
<b>Receiving Dock Doors Quantity</b>	4 overhead doors, 2 with dock levelers
<b>Distribution Dock Doors Quantity</b>	1 overhead door, 1 at-grade overhead door
<b>Receiving Area</b>	3,700 sf
<b>Warehouse</b>	5,700 sf
<b>Expansion Potential</b>	Available warehouse space in same building
<b>Location to AOA Line</b>	Adjacent
<b>Demising Wall Type</b>	Mesh wall to 10 feet, with mesh net to structure above

#### CRDF EQUIPMENT

<b>Cooler/Freezer Size</b>	Unknown
<b>Movement of Goods</b>	Pallet jack, hand truck

<b>Delivery Vehicles</b>	Box truck
<b>Other</b>	Printers for vendor-code stickers for all goods

#### **BUILDING SYSTEMS**

<b>Heating</b>	Yes, gas fired unit heaters
<b>Cooling</b>	Only in office/staff areas; warehouse is not cooled – portable fans are used
<b>Electrical Service</b>	Includes back-up power generator

#### **GOODS RECEIVING, SCREENING, DISTRIBUTION/RETURN**

##### **Delivery to One of the Dock Doors**

Goods are unloaded and moved towards the portal gate where they are screened via a visual search. The gate is opened from landside using a keypad, and then the goods move through the opening on their original pallet and are sorted and stored. When ready for distribution, the goods are repackaged onto carts by staff and moved via hand truck to the delivery vehicle. The vehicle departs the facility and drives on landside roads to a gate at the AOA line, approximately 200 yards from the dock door. The vehicle occupants are screened at the gate via badge and camera. The gate to the airfield opens and the vehicle drives through. The goods delivered to 5 locations at the terminal.

##### **Returns Gathered at Terminal**

Grease is moved to a dumpster near the CRDF. Beverage and pallet returns are stored in the airside warehouse until consolidated for pickup. Returns exit the warehouse through a designated vendor return portal to receiving docks where they are loaded.

#### **STAFF SCREENING/MONITORING**

The person who opens the facility screens their self with the magnetometer on camera. Staff who follow are then screened by the opener. Access to landside receiving is possible through dock doors and unscreened. Staff on airside must be screened and rescreened if leaving the secure area.

Receiving is monitored through a glass wall by management office.

#### **SECURITY/ACCESS CONTROL**

- TSA cameras
- Operator cameras
- Biometric scanner at limited locations
- Keycard access at many secure doors
- Keyed access at high value storage

#### **NOTABLE ATTRIBUTES**

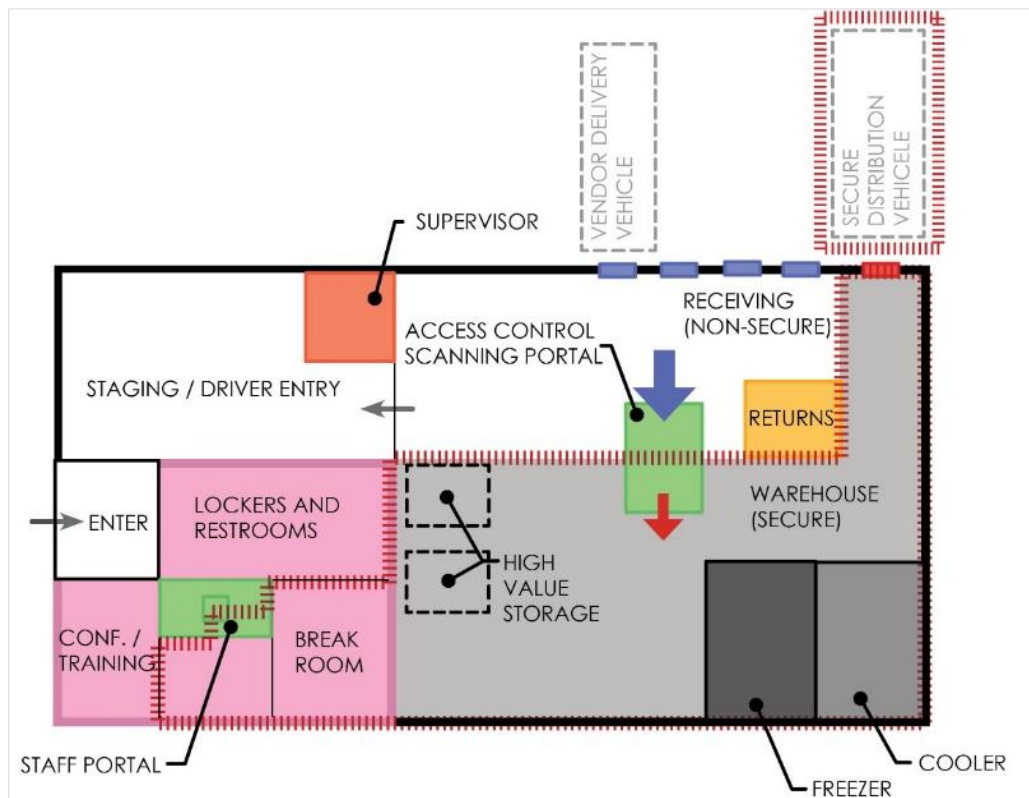
- Example of a renovated facility utilizing an existing building owned by the airport; demonstrates a relatively low cost to implement a CRDF.
- Requires additional security measures when a delivery vehicle is stored outside the dock on landside. Access to vehicle by general public is possible, and therefore delivery vehicles are screened more frequently than if parked on airside.
- Existing facility renovated for CRDF reduces ability to have most efficient movement pattern inside warehouse. Turns and movement of pallet truck can be tight at some locations.
- No airlock/sally port is present at the security portal, requiring rejected goods to pass back through the same portal.

- Control for portal gate to the secure warehouse is accessible from landside receiving, requiring close attention of activation during screening operations
- Occupant comfort requires supplemental airflow because climate creates uncomfortable working conditions when outside temperatures are above 70 degrees. Portable fans were evidence of user-managed comfort.
- Delivery mode flexibility was limited with the existing building. Delivery for small packages were made through the large roll-up dock door. This was required because there was not an at-grade roll-up door or ramp for deliveries. It is not known if small hand trucks or other small delivery items were handled in the same manner.

### LESSONS LEARNED

- Building Layout – renovation of an existing building required 90-degree turns in the goods movement path, increasing movement conflicts at high volume times of service

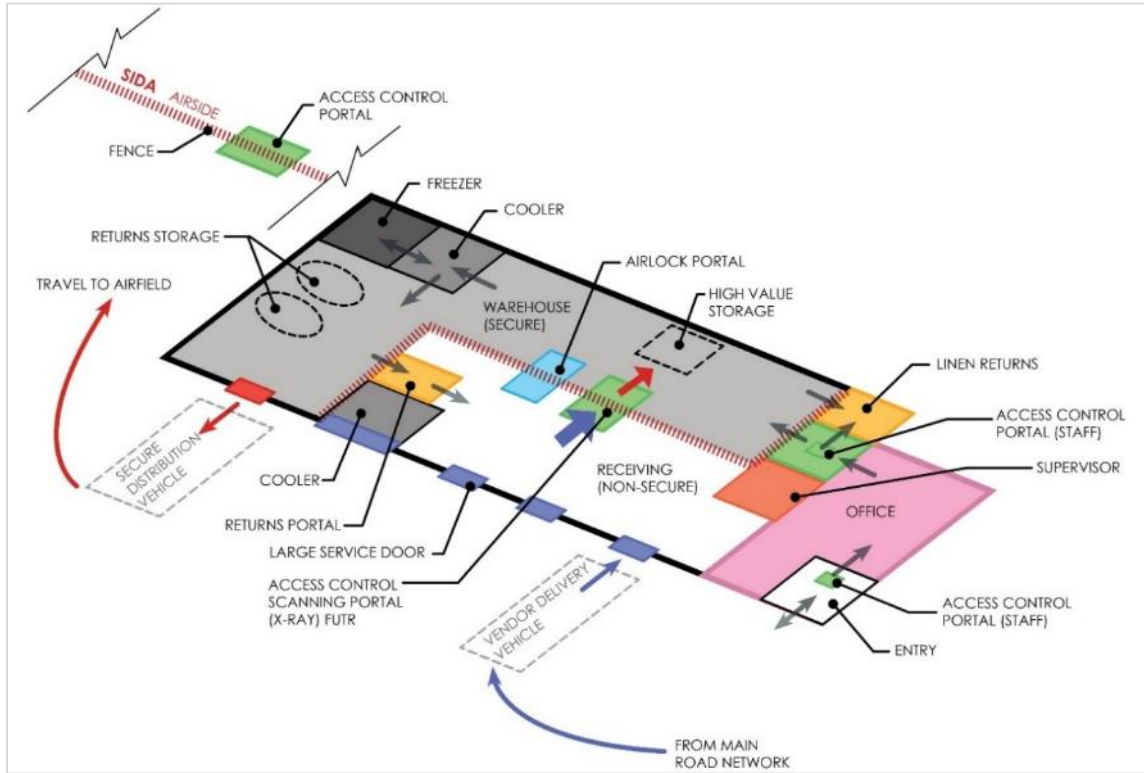
Figure B-13. Case Study 2: CRDF Plan Diagram



Source: Miller Dunwiddie



Figure B-14. Case Study 2: Type B-1 (Remote / Adjacent) CRDF



Source: Miller Dunwiddie

Figure B-15. Case Study 2: Receiving Interior



Source: Miller Dunwiddie

Screening portal at right, dock levelers on doors to left, vendor receiving area at desk area

**Figure B-16. Case Study 2: Portal to Warehouse**



Source: Miller Dunwiddie

**Figure B-17. Case Study 2: Warehouse Looking at Portal**



Source: Miller Dunwiddie

Equipment visible includes bins, carts, and hand trucks



**Figure B-18. Case Study 2: Cooler and Freezer in Warehouse**



Source: Miller Dunwiddie

**Figure B-19. Case Study 2: High Value Storage Areas**



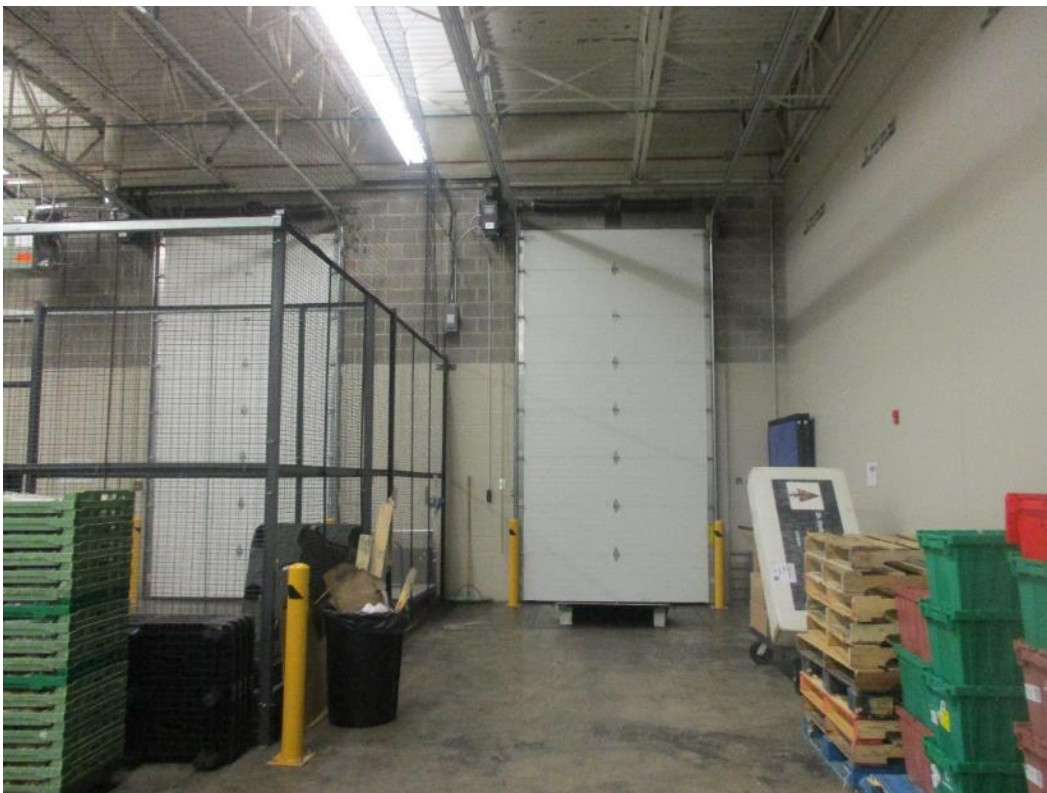
Source: Miller Dunwiddie

Figure B-20. Case Study 2: Returns in Warehouse



Source: Miller Dunwiddie

Figure B-21. Case Study 2: Distribution Door from Interior

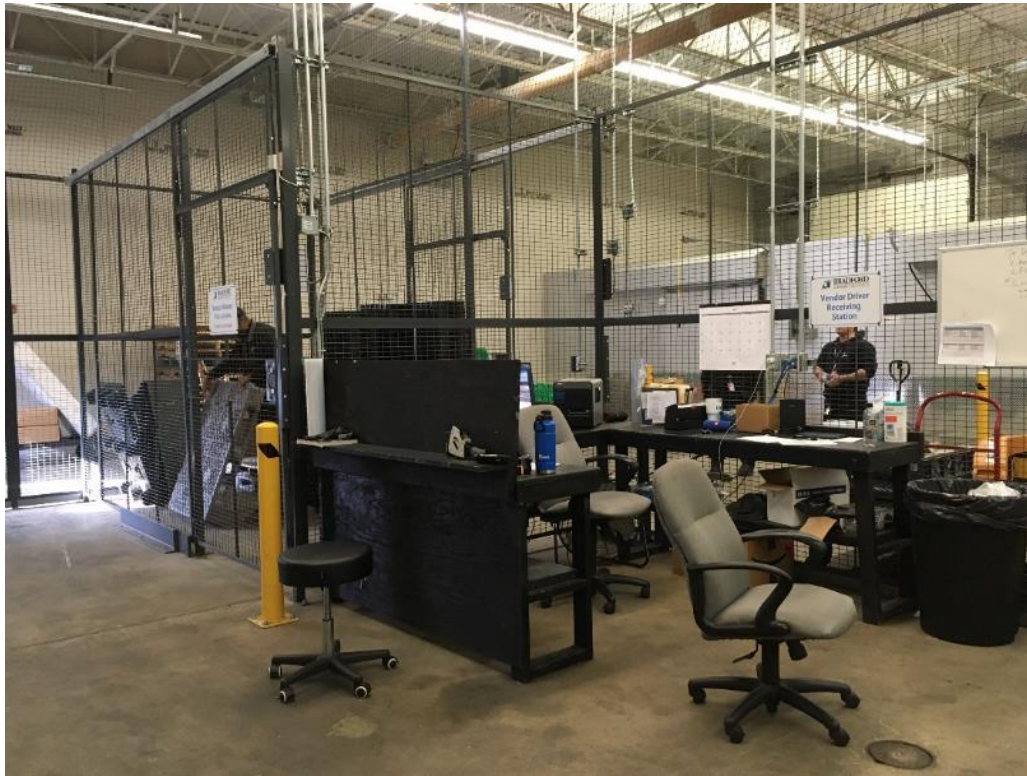


Source: Miller Dunwiddie

Movable ramp in foreground, return portal to left



**Figure B-22. Case Study 2: Vendor Driver Receiving Station**



Source: Miller Dunwiddie  
Vendor returns pick-up area at right, portal at left

**Figure B-23. Case Study 2: Staff Screening Portal**



Source: Miller Dunwiddie  
From interior (secure) side

## Case Study 3: Midwestern U.S. Large Hub Airport

### CLIMATE ZONE 6

#### OWNER/OPERATOR

<b>Owner</b>	Airport
<b>Airport Contact/ Manager</b>	Commercial Management & Airline Affairs
<b>Operator</b>	Third Party
<b>Staffing and Employer(s)</b>	Operator has 5 supervisory/management staff on site and 18 hourly staff

#### PROJECT IMPLEMENTATION

<b>Operator Solicitation</b>	Airport initiated a third-party logistics operator in 2003. A subsequent RFP was issued in March 2019 for a new logistics contract that would correspond with the opening of the new CRDF.
<b>Date Operational</b>	August 2019
<b>Previous Screening Location and Method</b>	Delivery to a landside dock at Terminal 1, product was visually screened, broken down, and sorted by operator into carts. The carts were loaded onto concessions operators' delivery trucks and entered airside through a gate. Deliveries throughout the terminals were by the operator's staff.
<b>Drivers for CRDF</b>	Congestion at inbound roadway to Terminal 1
<b>Funding Source</b>	Airport funds in CIP

#### GENERAL OPERATIONS

<b>Yearly Operating Cost</b>	Unknown
<b>Terminal Delivery Locations</b>	5 locations, most have storage
<b>Hours of Operation</b>	3 a.m. to 3 p.m.
<b>General Goods Handled/Returns</b>	Food, beverage, and retail deliveries; return of kegs, branded pallets, outdated magazines; inbound and outbound parcels are also processed through the CRDF and handled by the operator

#### BUILDING INFORMATION

<b>New/Remodel/Other</b>	New facility
<b>Square Footage</b>	22,000 sf
<b>Receiving Dock Doors Quantity</b>	7 full docks with dock levelers, 3 short docks with 2 dock levelers, 1 at-grade overhead door with a ramp
<b>Distribution Dock Doors Quantity</b>	4 full docks with dock levelers, 1 at-grade overhead door with a ramp
<b>Receiving Area</b>	4,400 sf
<b>Warehouse</b>	10,000 sf

<b>Expansion Potential</b>	Expansion area to the north for additional warehouse and docks, up to 8,000 sf
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<b>Location to AOA Line</b>	Straddle
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<b>Demising Wall Type</b>	Precast concrete/masonry wall to structure above
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#### CRDF EQUIPMENT

<b>Cooler/Freezer Size</b>	2,000 sf
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<b>Movement of Goods</b>	Pallet jack, hand truck
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<b>Delivery Vehicles</b>	Box truck
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<b>Other</b>	Printers for vendor-code stickers for all goods
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#### BUILDING SYSTEMS

<b>Heating</b>	Yes, gas-fired hot water system
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<b>Cooling</b>	Yes, in warehouse and office/staff areas
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<b>Electrical Service</b>	Includes back-up power generator
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#### GOODS RECEIVING, SCREENING, DISTRIBUTION/RETURN

Registered shippers deliver to one of the landside dock doors. Drivers check in at desks in the receiving area. Goods are unloaded into the receiving area and moved through the portal door into a sally port, where they are visually screened and cleared before moving into the warehouse. Both screening access points have access control. Goods move through the sally port on their original pallets and are then sorted onto carts for each concessionaire/destination by staff. They are moved via carts to the delivery vehicle at airside docks. The vehicle departs the facility and drives on airside service roads to one of 5 delivery locations at the terminal.

Returns are gathered at the terminal. Grease is moved to a dumpster near the CRDF. Beverage and pallet returns are stored in a returns room in the warehouse. Returns exit the warehouse through a designated vendor return portal to receiving docks where they are loaded.

#### STAFF SCREENING/MONITORING

The person who opens the facility screens their self with a magnetometer on camera. Staff who follow are screened by the opener. Access to landside receiving is possible through the dock doors and secured personnel doors. Staff on airside must be screened and rescreened if leaving the secure area.

Receiving is monitored through a glass wall by the management office.

#### SECURITY/ACCESS CONTROL

- Airport security cameras
- Operator cameras
- Biometric scanner at doors through the security line
- Keycard access at secure doors

#### NOTABLE ATTRIBUTES

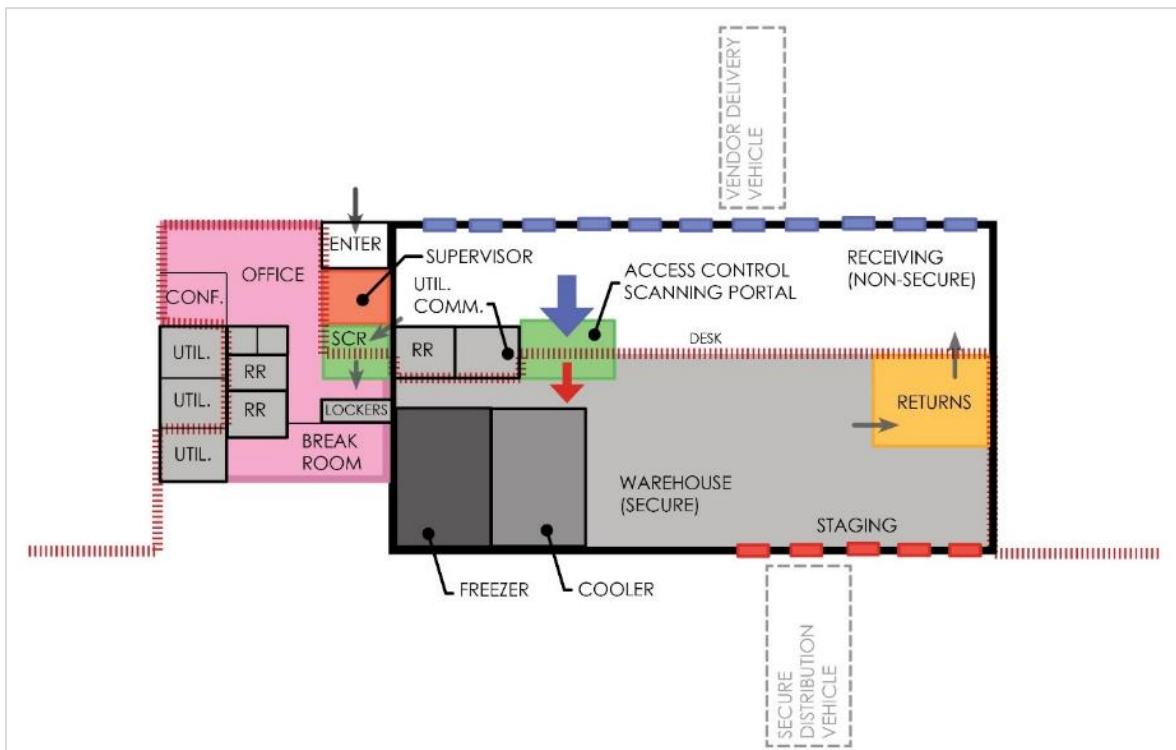
- As a new, ground-up facility designed to be energy efficient, it is expected to have lower operating costs compared to an existing building renovation.
- As a new, ground-up facility, the program could be configured to include space for growth in operations

- The building has delivery mode flexibility, including a combination of full size, shallow, and at-grade docks allowing flexibility in truck size and deliveries.
- The air-conditioned warehouse provides a better environment for product and staff over a naturally ventilated warehouse.
- This CRDF location is remote from both terminals, at an area of the landside and airfield with low vehicle traffic, allowing better truck access.
- This CRDF location is remote from terminal roadways, allowing easier access to the facility and more economical parking for staff.
- As a ground-up building in a northern climate, development costs for this CRDF are higher relative to development of an existing building in the same climate, because of modern building and energy codes.

**LESSONS LEARNED**

- Configured with vertical storing dock levelers, conditioned-air loss is reduced and pest control is improved because overhead doors seal better.
- Providing protective cover over dock locations by utilizing building overhangs can reduce weather impacts on loading operations.

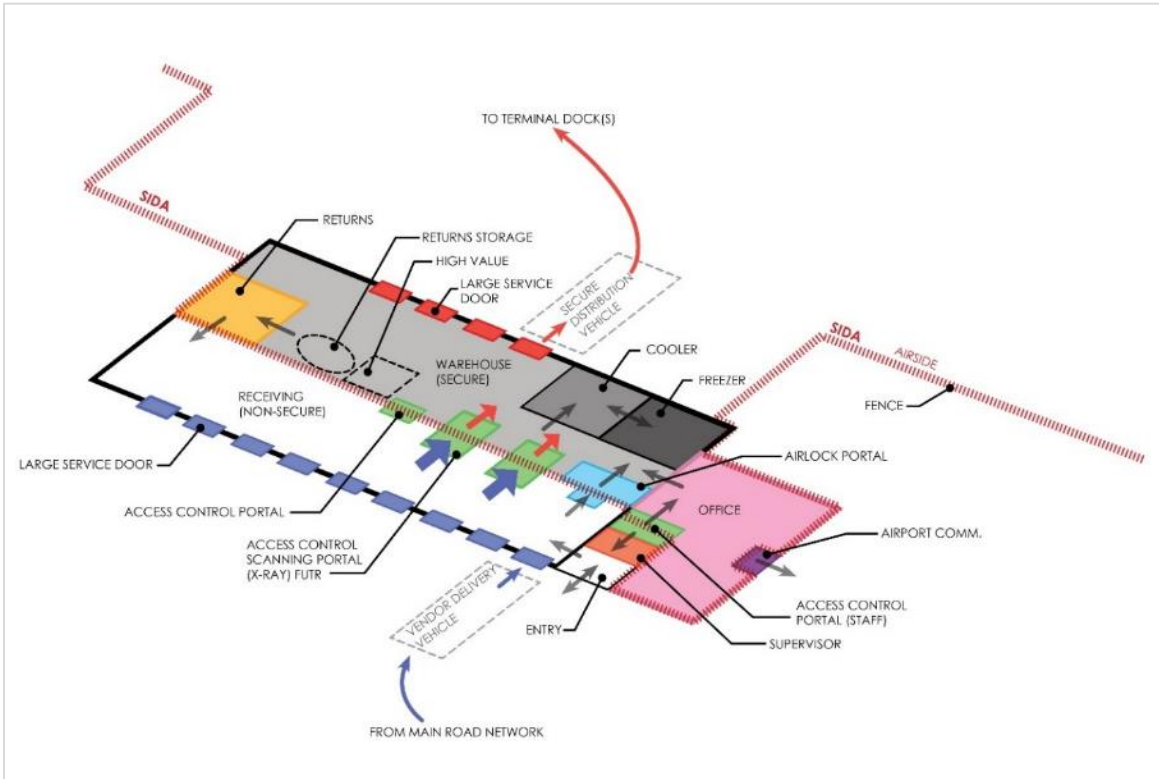
**Figure B-24. Case Study 3: Plan Diagram of CRDF**



Source: Miller Dunwiddie



Figure B-25. Case Study 3: Type A-1 (Straddle) CRDF



Source: Miller Dunwiddie

Figure B-26. Case Study 3: Receiving Interior



Source: Miller Dunwiddie  
Dock levelers on doors to left, vendor receiving area at desk area



Figure B-27. Case Study 3: Receiving Looking at Portal



Source: Miller Dunwiddie

Figure B-28. Case Study 3: Warehouse Looking at Screening Portal



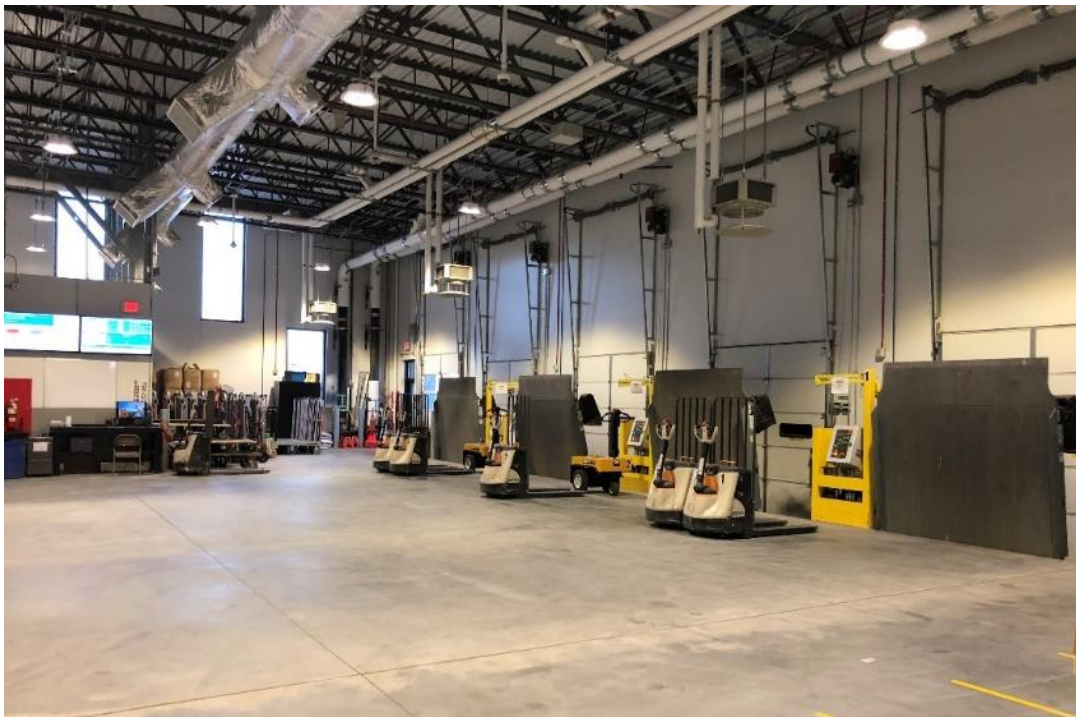
Source: Miller Dunwiddie

**Figure B-29. Case Study 3: Cooler and Freezer in Warehouse**



Source: Miller Dunwiddie

**Figure B-30. Case Study 3: Warehouse**



Source: Miller Dunwiddie  
Airside docks doors right, pallet jacks, and returns room left



Figure B-31. Case Study 3: Returns Room



Source: Miller Dunwiddie

Figure B-32. Case Study 3: Vendor Driver Receiving Station



Source: Miller Dunwiddie

**Figure B-33. Case Study 3: Staff Screening Portal**



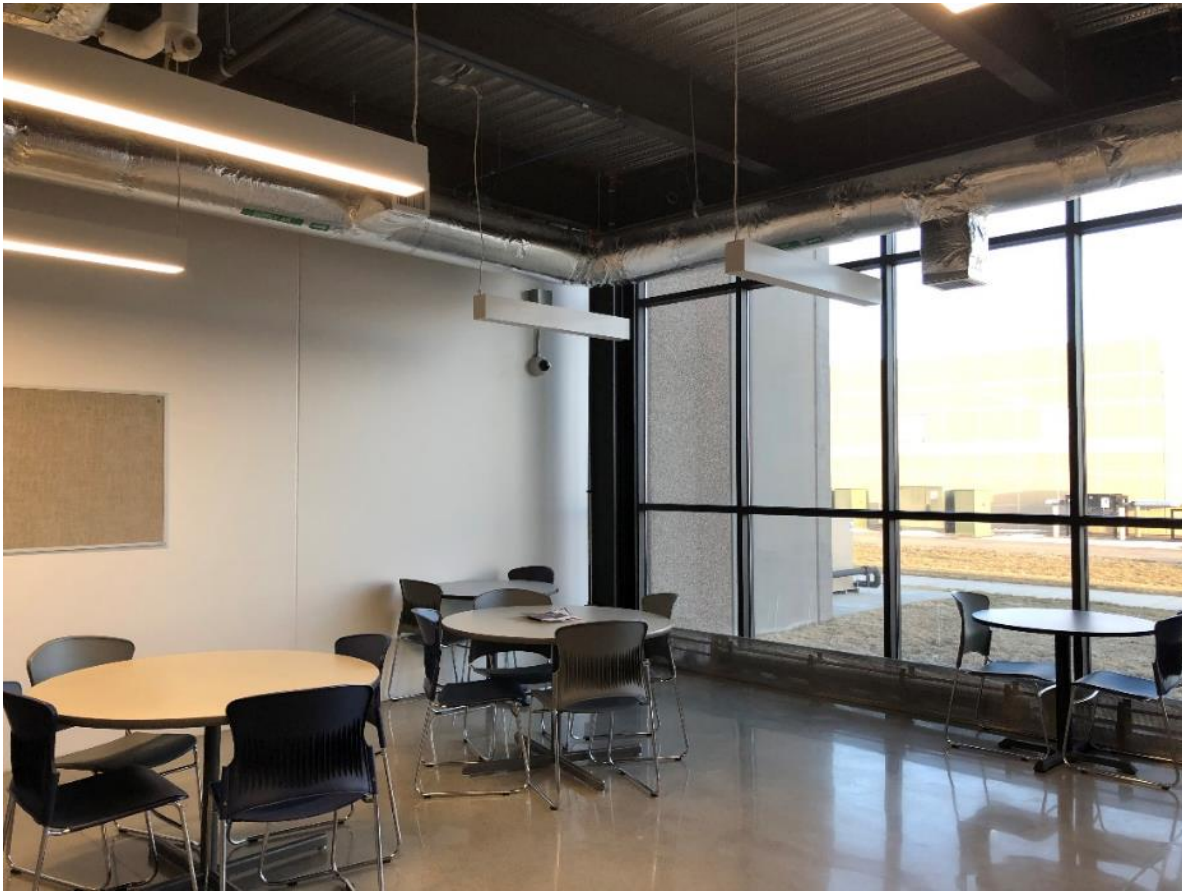
Source: Miller Dunwiddie  
From interior (secure) side

**Figure B-34. Case Study 3: Break Room Kitchen**



Source: Miller Dunwiddie

**Figure B-35. Case Study 3: Break Room Seating**



Source: Miller Dunwiddie



## Case Study 4: South-Central U.S. Medium Hub Airport

### CLIMATE ZONE 7A

#### OWNER/DEVELOPER/OPERATOR

<b>Owner</b>	Airport
<b>Operator</b>	Third Party

#### PROJECT IMPLEMENTATION

<b>Operator Solicitation</b>	The operator has been selected and will work with A/E and contractor to deliver the facility, in collaboration with the airport team.
<b>Date Operational</b>	February 2020
<b>Previous Screening Location and Method</b>	Hand screening through checkpoint at terminal
<b>Drivers for CRDF</b>	<ul style="list-style-type: none"> <li>• Growth in operations of terminal concessions over the last five years</li> <li>• The airport's vision for having a safer facility to process goods</li> <li>• Routing vehicles in closer proximity to have direct airside access to the terminal concourse</li> <li>• Relocating several "node" locations at the terminal will enhance movement of the deliverables to each concession area</li> <li>• Utilizing a space that has more room for capacity of the throughput, and that allows for loading docks and safer operations</li> </ul>
<b>Funding Source</b>	Airport operating funds and CIP funds

#### GENERAL OPERATIONS

<b>Yearly Operating Cost</b>	Unknown
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#### BUILDING INFORMATION

<b>Started Operations</b>	July 2020
<b>New/Remodel/Other</b>	Remodel
<b>Square Footage</b>	14,500 sf
<b>Expansion Potential</b>	15,000 sf is available, though additional airside dock access is limited
<b>Location to AOA Line</b>	Straddle
<b>Demising Wall Type</b>	Steel frame with some CMU partitions

#### CRDF EQUIPMENT

<b>Cooler/Freezer Size</b>	1,500 sf / 665 sf
<b>Movement of Goods</b>	Pallet jack, hand truck
<b>Delivery Vehicles</b>	Box truck
<b>Other</b>	Printers for vendor code stickers for all goods

#### BUILDING SYSTEMS

<b>Heating</b>	Yes, gas infrared
<b>Cooling</b>	Yes, office areas air conditioned

**Electrical Service** Yes, including backup generator

### GOODS RECEIVING, SCREENING, DISTRIBUTION/RETURN

The facility has 5 inbound docks. Unloaded goods proceed directly to the pallet scanner and/or four-point inspection area for secure processing. Once they are cleared, they are then disassembled for each designated concessionaire sorted and organized using the operator's tracking program in preparation for loading and delivery to the official node locations. All areas, including staging areas, are equipped with multiple PTZ cameras to ensure no tampering while goods await delivery.

### STAFF SCREENING/MONITORING

All staff are screened through an employee magnetometer as they enter the facility on daily basis. No outside drivers have access to the secure area, and trucks have a timed limit for drop off.

### SECURITY/ACCESS CONTROL

- Airport cameras (PTZ) – in multiple locations coordinated during design with the airport's Aviation Security department; these cameras are on a separate server in a controlled area for airport access only
- Operator cameras (PTZ) – Separation from the airport's security control system within the same IT Room, which is fully secure
- Backup generator system for the facility was installed and is maintained by the airport
- Access to receiving loading dock is controlled; delivery vendor must alert operator that vehicle is arriving so that operator is prepared to receive the delivery
- Keycard access at all doors
- Gate access to airside is also controlled and monitored by the airport
- Keyed access at high value storage
- Electrical infrastructure for complete scanning of all goods (pallet scanners)

### NOTABLE ATTRIBUTES

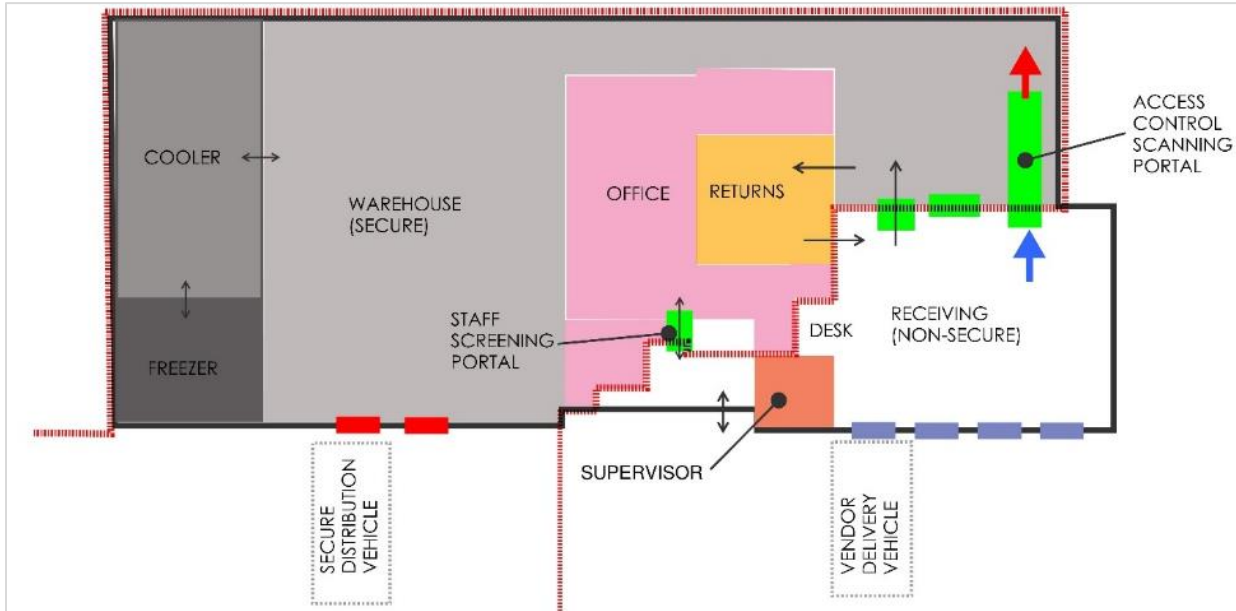
- Repurposing of existing facility at cross airport location, away from traveling public, minimized security risk from previous methods of delivery
- Selection of operator to design and construct
- Design-build delivery in 10 months
- Steel building with some CMU elements
- Designed to have room for future growth of airport concessions program
- Interior available capability for expansion
- No standby truck-staging area
- Though there is internal room for expansion, site constraints may limit the flow of delivery traffic on the airside of the building.
- CRDF operator was under a separate agreement and not involved in the design process, which led to needing multiple validations of the design
- Existing building constraints required relocation of AOA fencing for CRDF
- Cost per square foot was reasonable for a repurpose of facility
- No available opportunity for more docks or expansion



**LESSONS LEARNED**

- Combination of existing facility and design-build delivery using operator can streamline process and expedite facility opening
- Examination of available facilities for use as a CRDF should include standby truck-staging area

**Figure B-36. Case Study 4: Plan Diagram**



Source: Miller Dunwiddie

**Figure B-37. Case Study 4: Vendor Driver Check-In and Receiving Management**



Source: C&S Companies

**Figure B-38. Case Study 4: Interior of Receiving**



Source: C&S Companies

**Figure B-39. Case Study 4: X-Ray Device**



Source: C&S Companies  
Secure Screening portal from receiving

**Figure B-40. Case Study 4: Oversized Object Portal – Secure Side**



Source: C&S Companies

**Figure B-41. Case Study 4: Staff Screening Portal**



Source: C&S Companies



**Figure B-42. Case Study 4: High Value Storage**



Source: C&S Companies

**Figure B-43. Case Study 4: Combination Cooler/Freezer**



Source: C&S Companies

Figure B-44. Case Study 4: Staff Break Area with View of Secure Warehouse



Source: C&S Companies

Figure B-45. Case Study 4: Emergency Power Generator



Source: C&S Companies



## Case Study 5: Western U.S. Large Hub Airport

### CLIMATE ZONE 1

#### OPERATOR

<b>Operator</b>	Third Party
<b>Staffing and Employer(s)</b>	7–10 staff, working for operator; 4–5 drivers, badged, working for operator

#### PROJECT IMPLEMENTATION

<b>Operator Solicitation</b>	Concessions RFP document was issued concurrently with RFP for P3 developer of CRDF (both released December 2010) RFP for P3 developer included two-part solicitation in which selection would be made for Design-Build-Finance delivery
<b>Date Operational</b>	November 2012
<b>Drivers for CRDF</b>	Congestion with delivery trucks impacting curbside operations and public roadway. No specific node locations in existing terminal, which would minimize in-terminal delivery traffic. The CRDF was a critical support facility for the future terminal expansion, which is a green building project. The building selected had both landside and airside access to allow for loading docks serving both areas from inside the building (i.e., cross-dock operation).
<b>Funding Source</b>	Private and payback from airport authority

#### GENERAL OPERATIONS

<b>Yearly Operating Cost</b>	\$500k–\$1M
<b>Terminal Delivery Locations</b>	7 locations, small storage areas, one food-prep location
<b>Hours of Operation</b>	2:00 a.m.–11:00 a.m. (main); available for afternoon deliveries
<b>General Goods Handled&gt;Returns</b>	Food, beverage, retail deliveries, office supplies, FedEx, UPS, return of kegs, outdated magazines, food service grease collection

#### BUILDING INFORMATION

<b>New/Remodel/Other</b>	New-build CMU building
<b>Square Footage</b>	23,191 sf
<b>Receiving Dock Doors Quantity</b>	6 – all with overhead doors and dock levelers
<b>Distribution Dock Doors Quantity</b>	3 overhead doors with roll up ramps
<b>Operations Area</b>	14,251 sf
<b>Receiving Area</b>	2,700 sf
<b>Warehouse Area</b>	21,875 sf
<b>Expansion Potential</b>	Unavailable due to tight site; the CRDF was configured with capacity to meet demands of future airport development program

<b>Location to AOA Line</b>	Straddle
<b>Demising Wall Type</b>	Chain link separation wall
<b>CRDF EQUIPMENT</b>	
<b>Cooler/Freezer Size</b>	1,950 sf
<b>Movement of Goods</b>	Pallet jack, hand truck
<b>Delivery Vehicles</b>	Box truck
<b>Other</b>	Printers for vendor-code stickers for all goods

#### **BUILDING SYSTEMS**

<b>Heating</b>	Yes, gas fired unit heaters
<b>Cooling</b>	Conditioned space includes offices, staff areas, and the secure warehouse
<b>Electrical Service</b>	Includes back-up power generator

#### **GOODS RECEIVING, SCREENING, DISTRIBUTION/RETURN**

Delivery to one of the dock doors. Goods are unloaded and moved towards the portal gate, where they are screened with visual search. The gate is opened from landside using a keypad, and the goods are moved through the opening on their original pallet and then are sorted and stored. The goods are repackaged onto a pallet by staff, and then moved via hand truck to a delivery vehicle. The vehicle departs the facility and drives on landside roads to a gate at the AOA line, approximately 200 yards from the dock door. Vehicle occupants are screened at the gate via badges and camera. The gate to the airfield opens and the vehicle drives through. The goods are delivered to five locations at the terminal.

Returns are gathered at the terminal. Grease is moved to a dumpster near the CRDF. Beverage and pallet returns are stored in the airside warehouse until consolidated for pickup. Returns exit the warehouse through a designated vendor return portal to receiving docks and are loaded.

#### **STAFF SCREENING/MONITORING**

The person who opens the facility screens their self with the magnetometer on camera. Staff who follow are screened by the opener. Unscreened access to landside receiving is possible through dock doors. Staff on airside must be screened and rescreened if leaving the secure area.

Receiving is monitored through a glass wall by management office.

#### **SECURITY/ACCESS CONTROL**

- Airport cameras
- Operator cameras
- Separation in IT room
- Dry room fire system in the IT room covers both airport and operator systems
- Backup generator systems for operator within building, supports operator needs and is maintained by the operator; backup power for airport systems, including access gate, is provided by airport backup power infrastructure
- Magnetometer walk-through scanner systems are used to screen anyone entering the warehouse; all personnel entering the warehouse must also be badged
- Access to receiving loading dock is controlled; delivery vendor must alert operator that vehicle is arriving so that operator is prepared to receive delivery
- Keycard access at many secure doors

- Keyed access at high value storage
- Future electrical infrastructure of high-volume product scanning – two locations

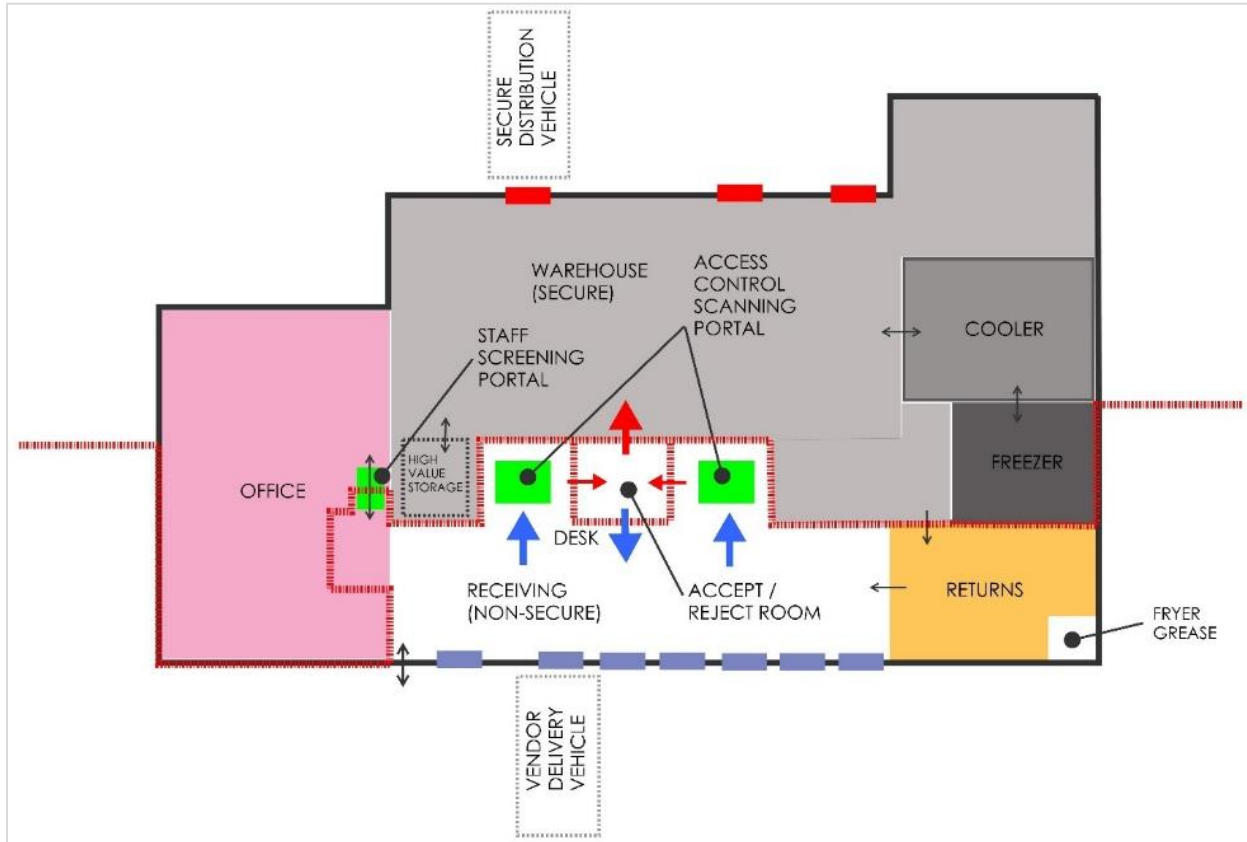
#### NOTABLE ATTRIBUTES

- Example of fast-track delivery: design and construction took 11 months
- Example of ground-up construction and use of durable materials – concrete masonry was used for exterior, affording longer life-cycle costs
- Example of sustainable design: LEED Gold Certified building
- Includes a truck standby area for vendors
- Economical project delivery approach for the airport; no upfront capital expenditure funding was required
- Achieved a critical site goal: Ground up building allowed custom configuration of program spaces to fully utilize a tight lease area and maximize use of airport property
- Achieved 15.7% savings using P3 delivery versus traditional CIP
- Example of a collaborative process between design team and the operator, while the operator was also a separate P3 developer
- Ingress from airside is limited, which may present a challenge when future growth occurs
- Operator is under a separate agreement with the airport, which required multiple validations
- Building layout and sizing was prescriptive by planning architect, which meant that changes required had a cost impact to the owner
- Cost per sf was reasonable for type, but pre-engineered building could have been cheaper and have less impact to user
- Loading dock wells had water treatment requirements, which created challenges in door alignment that were resolved through the design process

#### LESSONS LEARNED

- Rotating screening portals 90 degrees allows goods to feed into a rejection portal, adding an option to remove goods following screening, before they enter the secure warehouse

Figure B-46. Case Study 5: Plan Diagram



Source: Miller Dunwiddie

Figure B-47. Case Study 5: Interior Loading Dock, Landside



Source: C&S Companies

**Figure B-48. Case Study 5: Interior Secure Warehouse**



Source: C&S Companies



## Case Study 6: Southeastern U.S. Large Hub Airport

### CLIMATE ZONE 9B, 10A

#### OWNER/OPERATOR

<b>Owner</b>	Airport
<b>Operator</b>	Third Party
<b>Staffing and Employer(s)</b>	18 operator staff (4 salaried supervisors/managers, and 14 logistic specialists x 8 hours); 18 operator, badged drivers

#### PROJECT IMPLEMENTATION

<b>Operator Solicitation</b>	RFP 2015
<b>Date Operational</b>	February 15, 2016 Soft start with new concessionaires; retained former delivery arrangements for those with older leases over a period of 18 months
<b>Drivers for CRDF</b>	New terminal expansion project beginning in 2014 included a large concessions program that required a CRDF approach; this was called out in Airport Master Plan.
<b>Funding Source</b>	Percentage of tenant and concessionaire revenues

#### GENERAL OPERATIONS

<b>Yearly Operating Cost</b>	\$1.5–\$2M
<b>Terminal Delivery Locations</b>	4 remote concourses and 1 terminal building; most have storage
<b>Hours of Operation</b>	2 a.m.–8 p.m., 6 days per week
<b>General Goods Handled&gt;Returns</b>	Food, beverage, retail deliveries, office supplies, FedEx, UPS; return of kegs, pallets, other recyclable material, outdated magazines, food service

#### BUILDING INFORMATION

<b>New/Remodel/Other</b>	New construction
<b>Square Footage</b>	20,000 sf
<b>Receiving Dock Doors Quantity</b>	9 overhead, high lift doors and dock levelers – 1 drive-in
<b>Distribution Dock Doors Quantity</b>	8 overhead, high lift doors – 1 drive-in
<b>Receiving Area</b>	4,000 sf
<b>Warehouse Area</b>	14,000 sf
<b>Expansion Potential</b>	Potential building site adjacent to building
<b>Location to AOA Line</b>	Straddle fence
<b>Demising Wall Type</b>	Mesh wall to 10 feet, with mesh net to structure above

#### CRDF EQUIPMENT

<b>Cooler/Freezer Size</b>	Cooler 1,280 sf / Freezer 896 sf
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<b>Movement of Goods</b>	Pallet jack, hand truck
<b>Delivery Vehicles</b>	3 refrigerated box trucks, one van
<b>Other</b>	Printers for vendor-code stickers for all goods

#### **BUILDING SYSTEMS**

<b>Heating</b>	Gas-fired unit heaters
<b>Cooling</b>	Air conditioning
<b>Electrical Service</b>	Includes back-up power generator

#### **GOODS RECEIVING, SCREENING, DISTRIBUTION/RETURN**

Delivery to one of the dock doors. Received goods are moved into an airlock gated area, and are screened via a visual search before being moved into secured area. The gate is opened from landside using badge and keypad. The goods are moved via pallet jack and logistically organized, and then are moved to the delivery vehicle at the planned distribution time. The vehicle departs the facility, driving onto the AOA, and delivers to 5 remote concourses and one terminal building.

Returns are gathered at each location. Returns exit through a designated vendor return portal to receiving docks and are loaded.

#### **STAFF SCREENING/MONITORING**

The person who opens the facility screens their self with magnetometer on camera. Staff who follow are screened by the opener. Unscreened access to landside receiving is possible through dock doors. Staff on airside must be screened and rescreened if leaving the secure area.

Receiving is monitored through a glass wall by management office.

#### **SECURITY/ACCESS CONTROL**

- TSA and airport cameras
- Operator cameras
- Biometric scanner at limited locations
- Keycard access at many secure doors
- Keyed access at high value storage

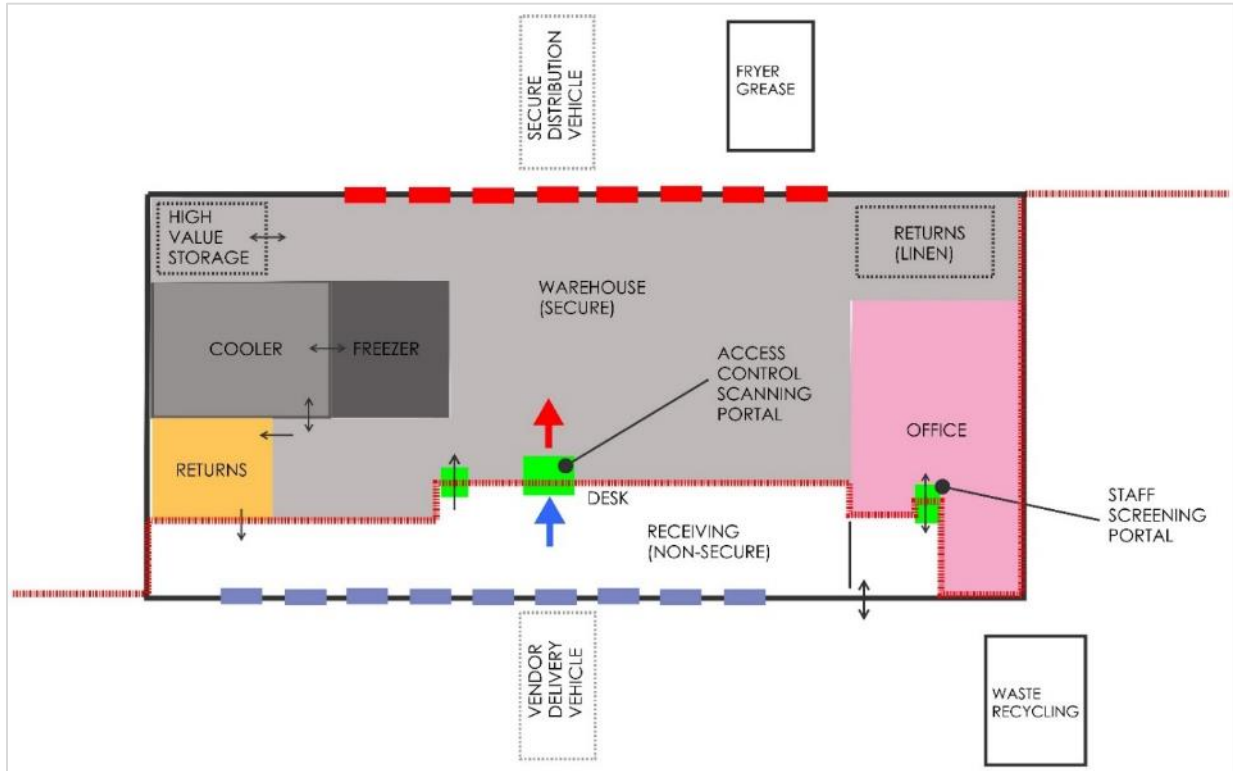
#### **NOTABLE ATTRIBUTES**

- New facility; well built with very few problems
- Case Study 5 CRDF layout used as basis of design
- Narrow receiving area that gets congested at times
- The CRDF operator cannot deliver on public roadways at the terminal, so deliveries to landside locations have to be made via airside nodes. This led to inefficiencies, and required additional staffing when TSA added restrictions to limit staff movement between landside and airside

#### **LESSONS LEARNED**

- Additional depth in receiving should be considered when a large number (over 4) of receiving dock doors are utilized
- Configuring support spaces with glass walls facing receiving and secure warehouse allows increased monitoring of floor by staff

Figure B-49. Case Study 6: Plan Diagram



Source: Miller Dunwiddie

Figure B-50. Case Study 6: Receiving Interior



Source: C&S Companies

Portal at right, dock levelers on doors to left, used pallets stacked for return to vendors in morning

**Figure B-51. Case Study 6: Receiving and Employee Areas**



Source: C&S Companies  
Viewed from secured area

**Figure B-52. Case Study 6: Secured Logistics Sortation Area**



Source: C&S Companies  
Cooler in background



**Figure B-53. Case Study 6: Outbound Doors**

Source: C&S Companies  
Cooler – Freezer in background



## **APPENDIX C: EXAMPLE RFP FOR CRDF OPERATOR**

An RFP for Salt Lake City Corporation Department of Airports Central Receiving and Distribution Center (CRDC) Logistics Manager Service (2019) can be found in [this attachment](#).

## APPENDIX D: CRDF PROGRAMMATIC AREAS

Table D-1. Programmatic Areas

Space	Function	Additional Criteria	Sizing
Loading Dock	<p>Designed to accommodate the peak drop-off activity, normally early in the morning.</p> <p>The dock should accommodate deliveries by tractor-trailer trucks, step-vans, and required material handling equipment.</p>	<p>The loading dock platform should be large enough to provide staging for off-loading of product during the receiving process, as well as adequate vehicle circulation.</p> <p>Good lighting for both the outside and inside of the loading dock is necessary. Lighting should be adequate to ensure the effectiveness of the CCTV system. Lighting levels inside the loading dock must be adequate to perform all screening tasks.</p>	<p>A rule of thumb for sizing the receiving dock is to multiply the footprint of the typical delivery vehicle by the number of vehicles at peak time (2–87). This area allows all goods to be offloaded and held before screening.</p>
Security Portal and Processing Equipment	<p>Current TSA regulations require that products destined for SIDA, Secured, and Sterile Areas of the airport be inspected.</p>	<p>It is important that adequate space be provided for the required inspection/screening process during peak receiving hours.</p>	<p>Consider what may be required in the future regarding screening, and incorporate the flexibility to scale the inspection process for potential future needs.</p> <p>Of the CRDF locations studied, most provided additional space within the portal area for future electronic screening equipment.</p>
Storage Areas	<p>At a minimum, a secure storage warehouse for received goods needs to be provided in the receiving area, so that products can be temporarily stored until delivery to consignees and the terminal.</p>	<p>CRDFs quickly process and distribute goods. With a CRDF consolidated receiving and storage philosophy, and in order for the airport to reap the productivity benefits of such a policy, it is important that only short-term storage areas be provided in areas of the terminal adjacent to concessionaires. Otherwise, there is the possibility of facility over-sizing, the cost of which may not be justifiable.</p>	<p>The airport's receiving process and contracts with their concessionaires and possibly third-party cargo handlers determines storage area size.</p> <p>If adequately sized long-term storage areas are not located throughout the terminal building, it may be beneficial to provide consolidated, long-term storage facilities at the CRDF. The storage would need to accommodate the peak demand for goods handled by each concessionaire.</p>
Employee Support Areas	<p>Incorporate restrooms, break rooms, communications, and other spaces in the design.</p>		

Source: PARAS 0004, 2017

## APPENDIX E: CRDF LOCATIONS AND BUSINESS MODELS

Table E-1. CRDF Locations and Status

Location	Status of CRDF
<b>BOS</b>	Operational
<b>BNA</b>	Operational
<b>DAL</b>	Operational
<b>GSP</b>	Operational
<b>IAD</b>	Operational
<b>IAH/HOU</b>	Planning / RFP / Implementation
<b>IND</b>	Operational
<b>MCO</b>	Planning
<b>MSP</b>	Operational
<b>ORD</b>	Planning
<b>PDX</b>	Operational
<b>SAN</b>	Operational
<b>SFO</b>	Planning
<b>SLC</b>	Operational
<b>TPA</b>	Operational

Table E-2. Selected CRDF Business Models

Hub Size	CRDF Business Model	Remarks
Large Hub	25% on concession sales, 75% to airlines	Supplies airline clubs
Large Hub	Allocated on amount of space the concessionaire has under lease	
Large Hub	Terminal 1: CRDF cost is contained in the O&M budget Terminal 2: CRDF cost is built into the concessionaire space lease rates	Cost is not seen as an individual expense line item
Large Hub	F&B concessions pays 2.5% of sales, Retail concessions pays 0.75% of sales, Specialty Retail pays 1.5% of sales, airport absorbs any differences	This includes a consortium of services pays for janitorial, trash removal, pest control, CRDF, & advertising
Large Hub	30% airline & 70% concessions based on sales	
Large Hub	Airport pays 5%; 95% is allocated to concessions based on monthly sales	
Large Hub	TBD, but based on % of sales per type of unit (Retail, Duty Free, F&B, etc.)	

Hub Size	CRDF Business Model	Remarks
Large Hub	F&B concessions pay 2% of sales; Retail concessions pay 1.5% of sales	At the beginning of the concessions expansion program, the airport subsidized any cost difference; but the concessions program is now 100% complete and is generating excess money for the airport to fund other programs
Large Hub/ Medium Hub	100% funded by the airport with no additional costs to concessionaires or other tenants.	
Medium Hub	Airport pays 10%; 90% allocated to concessions on monthly physical volume (cubic feet)	Least-preferred model because volume does not distribute equally; sales is a better measure (e.g., Rolex watches are high dollar/low volume)
Medium Hub	Allocated on amount of space the concessionaire has under lease	
Medium Hub	Allocated on concession sales	
Medium Hub	Allocated on amount of space the concessionaire has under lease	
Medium Hub	Allocated on amount of space the concessionaire has under lease	
Small Hub	Allocation based on leased square feet	

Source: Landrum & Brown