ADDENDUM NO. 2  
TO  
REQUEST FOR PROPOSAL FOR  
Replacement for Parking Access Revenue Control System (PARCS)  
GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT  
GREER, SC  
August 28, 2019

This ADDENDUM forms a part of the Request for Proposal dated 7/29/19. Acknowledge receipt of this ADDENDUM in the space provided on Form 3. **Failure to do so may subject Bidder to disqualification.**

Item #1: Please provide clarification of support service and software during and subsequent to the warranty period.

Service and software are required to be provided during the warranty period and should be priced on Form 5 - Bid Form. Service and software are required to be provided for an additional four (4) years subsequent to the conclusion of the warranty period and should be priced separately as requested on Form 5 - Bid Form.

Item No 2: Bidder questions received by 8/23/19 are shown below.

**Question #1:** Please confirm the Airport does not have tax exemption status?

**Answer #1:** The District is not tax exempt. Proposals should include all applicable taxes.

**Question #2:** Please confirm the bonding requirements for the project?

**Answer #2:** The bond requirements per District policies is as follows: P&P Bond = 100%  
Bid bond = 5%

**Question #3:** Page 11, Section 1.0, D. III. - A sample set of reports that are fundamental and readily available with the equipment are to be included with the proposal. We request that due to the number of reports the system can generate and the limitation on the number of pages to be included in the proposal that sample reports be included in the electronic version of the submission.

**Answer #3:** Agreed.

ADDENDUM NO. 2  
Page 1
Question #4: Page 11, Section 1.04, 24.- Project Functional Specifications, Parcs shall integrate with existing and new single space parking count system by Park Assist. The Park Assist system is already installed and functioning in the two existing garages as a stand-alone system. What is the airport’s intention in terms of the integration?

Answer #4: The two systems need to share parking space utilization and availability in order to provide accurate information in reports and on any public application.

Question #5: Page 12, Section 1.04, F. - Project Functional Specifications, The GSP Airport will provide Virtual Servers. However, on page 52, Section 2.04, A. 1. States that the Contractor shall propose a virtual server solution for the project. Server shall be provided, installed and maintained by the Contractor. Section 5 then states GSP will provide the virtual server systems. Please clarify as noted in the pre-bid that servers are to be provided by the Airport.

Answer #5: The airport will provide and maintain the virtual server(s).

Question #6: Page 12, Section 1.05 A. Submittals – Contractor shall submit to the Owner or Owner’s Representative plans and specification for any necessary civil/site work. Is the cost of the civil work to be the responsibility of the contractor or owner? If the contractor, where should those costs be listed on the cost proposal forms?

Answer #6: Panels, breakers, and conduit will be provided for new construction (Employee Lot, Economy B&C, Garage B&C exit plaza). Pathways exist for the remaining existing sites for entry/exit lane ticketing equipment. The contractor will pull wire and fiber for each new site.

The Contractor must provide pathway/infrastructure/wiring, etc. for the new signage, POF and LPR cameras power and data. The contractor is responsible for any further infrastructure required for the equipment as outlined in the Bid Form and Functional Specification.

Question #7: Page 20 E.1 c. - Please confirm that the contractor will provide new network switches – please specify any brand and model, if currently used by GSP.

Answer #7: GSP will provide the network switches. They will be Cisco switches.

Question #8: The RFP states 2 entries for Lot B and 2 entries for Lot C. Are economy B and C separate or combined? If they are combined in anyway the phasing may need to be adjusted (Economy C has a date of October 2020 and economy B has a date of April 2021). We would be running 2 different systems on these lots between October 2020 and April 2021.
Answer #8: Both Economy Lots B and C must be operational by October 2020.

Question #9: Page 22, Section Table 1. Lanes by facility. Garage C does not show any exit lanes. Please confirm.

Answer #9: Garages B & C use a consolidated exit plaza. The exit lanes are shown under Garage B.

Question #10: Page 22, Section Table 1. Lanes by facility. No AVI lanes are shown for Garage B and C. Please confirm.

Answer #10: AVI will only be used in the surface lots.

Question #11: Page 23 A. d – Please confirm all GSP provided servers will include the required space for hourly backups specified in the RFP.

Answer #11: Yes.

Question #12: Page 48, Section 9 - Audit and Reporting, develop and prepare up to ten (10) additional “Custom Reports”. The contractor respectfully requests that this requirement be removed due to the uncertainty of what the custom report may entail and what the associated cost may be without concise specifications for the development.

Answer #12: GSP realizes this is an estimate and should be included in the pricing and quantified. Proposer to provide manhour estimate and rates for development of custom reports.

Question #13: Page 55, Section 2.04, A. 7. F. The PARCS shall integrate with GSP’s Sage Intact Financial Application. Please clarify what information may the Airport which to have pushes of pulled?

Answer #13: The solution will need to integrate with Workato https://www.workato.com/. This is how data will get in and out of Sage Intacct and GCR.

Question #14: Page 62, Section K. 2. - The AVI system shall be the uPASS Reach System manufactured by Nedap. Will the airport consider other manufacturers to provide an AVI solution?

Answer #14: The Offeror should respond to the RFP using Nedap. The Offeror may provide an alternate solution outside the base pricing.

Question #15: Airport noted in the pre-bid meeting that the command center will be located in the terminal. Please confirm.
Answer #15: That is the current thinking, although a specific location has not yet been determined.

Question #16: Page 65, Section 6. M. 2. D. Non-resettable, mechanical gate action counter mounted in the barrier gate housing. This is an antiquated application that is not needed with an automated RCS. We request this section be removed from the specification.

Answer #16: Agreed. This requirement will be removed.

Question #17: Page 67, Section 8. a. LPR cameras are not shown for the Sky Lots. Please confirm.

Answer #17: Confirmed.

Question #18: Page 69 section 1.e - Proximity card only allows vehicles linked to badge system. Please provide detailed specifications for desired badge system format to ensure the system is compatible.

Answer #18: The system must read the Indala FlexCard Prox Clamshell (Part # - FPCRD SSSMW-0000)

Question #19: Page 90, Section H. Contractor shall provide two temporary cashier stations for training purposes. What is considered temporary and should this be included in the cost proposal form?

Answer #19: Remove this requirement. Cashier terminals are not required for training.

Question #20: General Information. Are there any changes to the Garage A rental car exit lanes?

Answer #20: One exit lane on the south side will be converted to an entry lane. One current RAC entry lane will be converted to an exit lane. These two (2) lanes will be converted in November 2022 after Garages B&C are completed.

Question #21: General Information. Are Garages B and C sharing exits? If so, should a passthrough gate be added / required for exiting garage C?

Answer #21: See Question/Answer #9. No passthrough gate is required.

Question #22: Please provide the GSP Standard Form of Contract as referred to in the RFP. Hope to have it in this addendum.
Answer #22: Please see the enclosed Form of Agreement.

Question #23: Do we include LAZ BI (Business Intelligence) and LAZgo integrations? Will any of these systems provide the reservation or Frequent User Programs?

Answer #23: GSP does not intend to use LAZ applications. We request the proposer provide applications for reservations systems, frequent parkers, options as requested by the functional specification as part of new PARCS system.

Question #24: Will KH provide any required drawings and permits for this project?

Answer #24: There are multiple design firms that are designing various facilities associated with this project. Drawings will be provided. The most current drawing of the Economy Lot and Employee Lot are included with this Addendum.

Question #25: Is the transient ticket to be a receipt ticket or card ticket?

Answer #25: Either is acceptable. Proposer to identify what their preferred system/offer is providing.

Question #26: In recent Airport bids, PARCS providers have avoided offering a full turnkey solution, is the intent that these offers are to be presented full turnkey with all civils and cabling included as a mandatory requirement?

Answer #26: Yes. Please see question #6 above.

Question #27: Is there a design for the Dynamic Signage that is to be provided? What is it to show/where is to be mounted/what size is it to be?

Answer #27: The dynamic signs are to show whether an exit lane is open/closed, credit card only or cash/cashier. Each sign will be 2 lines of text and approximately 18”h x 30”w. Location will be coordinated with the PARCS contractor and determined at a later date.

Question #28: Can we be provided as-builts to confirm existing fiber paths?

Answer #28: Communication as-built drawings will be provided to the selected vendor. Existing lanes currently have fiber to existing equipment. Contractor will pull fiber to new lanes.

Question #29: Can you identify the anticipated locations for POF machines and show current power and communications termination locations?
**Answer #29:** Exact locations have not been determined. See Question #6, reference power and communications.

**Question #30:** Article 10.g (page 32) Can we add, re-install gate arm to the list of “Owners” responsibility?

**Answer #30:** Yes.

**Question #31:** Can you please confirm the number of Cashiered Exit Lanes

**Answer #31:** Yes. One (1) at the Garage B&C exit plaza and one (1) at Garage A. Please see revised Form 5 – Bid Form.

**Question #32:** With respect to the Addendum, the Equipment Counts do not add up correctly. Can you please provide confirmation of the number of devices for each category and location?

**Answer #32:** See the table below and Form 5 – Bid Form.

**Question #33:** Also, regarding the note “Bus Lanes are reversible”, does that apply only to the 4 Bus Lanes in Economy B/C and Employee Lot and if so does that mean for the 4 lanes identified that there will need to be 8 AVI readers?

**Answer #33:** There is one (1) bus lane at Economy B, one (1) bus lane at Economy C, and one (1) bus lane at Employee Lot all of which are bi-directional.

**Question #34:** Will the Authority consider an extension of time for the RFP Responses?

**Answer #34:** The revised timetable for the RFP process is amended as follows

- **RFP due date:** September 19, 2019 at 12:00pm
- **Offerors presentation/interview (If required):** Week of September 30, 2019
- **Evaluation Panel Meets and Makes Selection Recommendation:** October 10, 2019
- **NTP:** October 31, 2019

**Question #35:** Due to the timeframe when the last addendum is released and the upcoming Labor Day holiday will a two week extension be granted for the response due date?

**Answer #35:** Please see response to Question #34 above.
Question #36: Section 1.04.A.25 Page 12 – Will GSP Airport provide all civil and electrical work for the LPR cameras per the PARCS contractors proposed designs?

Answer #36: Please see response to Question #6 above.

Question #37: Section 1.04.F Page 12 & Addendum #1 – Will GSP Airport be supplying the OS, Database, Anti-Virus and backup software for the servers they are providing for this project based upon the PARCS vendor’s needs?

Answer #37: The airport will provide this.

Question #38: Section VIIII Attachment A Page 19 Drawing C3-1 – Drawing C3-1 dated 07/25/2019 shows a new entry/exit plaza with shuttle bus lane in the southwest corner of the existing Lot B. When this entry/exit plaza opens do the existing entry and exit plazas to Lot B close? If not should equipment for the existing entry and exit plaza be added to the proposal form 5?

Answer #38: The existing entry and exit lanes will be closed.

Question #39: Section 1.08.E Page 20 – Will GSP Airport be providing all electrical and civil modifications required to install the new POF devices?

Answer #39: Please see response to Question #6.

Question #40: Section 1.08.E.1.a Page 20 – What type of fiber optic cable and termination type is currently installed at GSP?

Answer #40: Multimode LC.

Question #41: Section 1.08.E.1.b Page 20 – Is the fiber optic communication backbone currently in place between the Garage B parking office and the data center located in the terminal? If so what type of communication link is currently installed? If not, who is to install this communication link?

Answer #41: Yes, Multimode LC is currently in place.

Question #42: Section 1.08.E.1.c Page 20 – Please provide the GSP’s Governing Standards and Design Criteria document.

Answer #42: Remove.

Question #43: Section 1.18.A Page 36- How many proximity cards are required for the project?
Question #43: None.

Question #44: Section 2.01.D.3 Page 39 – Please clarify what “database hardware” would need to be provided by the Contractor.

Answer #44: None.

Question #45: Section 2.01.G.M.1 and 3 Page 45 – Please clarify what specifically these statements are in reference to an integration to the Airport’s website.

Answer #45: The District will need to display the current pricing, number of stalls available, and/or lot status (open/full/closed) at each facility as it is changed. Marketing message will be developed and displayed by a different department.

Question #46: Section 2.03.D Page 52 – Please provide Appendix C so the proper Ethernet equipment and design may be proposed.

Answer #46: Please refer to attachment included with this addendum.

Question #47: Section 2.03.E. Page 52 – states that the contractor shall propose a solution for network maintenance. What are the airport’s requirements for network maintenance?

Answer #47: Section 2.03.E. Page 52 can be removed.

Question #48: Section 2.04.A.7.c. Page 54 – Does the Airport require test equipment and software for training and testing of software updates and enhancements? If so, does this need to be part of the proposal or will a change order be issued at system acceptance.

Answer #48: No.

Question #49: Section 2.04.A.7.f Page 55 – Please identify if the SAGE Intact Financial Integration is part of the KPI’s as stated on page 14 and 15 of the Functional Specification.

Answer #49: No.
Question #50: Section 2.04 A.8.a.3) Page 55 – Are these APC UPS’s currently in place? Are UPS’s required for the plaza level entry/exit equipment network switches?

Answer #50: UPS equipment has been removed from this project.

Question #51: Section 2.04 A.8.a.4) Page 55 – Please clarify what optional network equipment is being requested.

Answer #51: This allows vendors to propose any additional network equipment they believe necessary.

Question #52: Section 2.04.H.2.q, r & s Page 58 – Are EMV readers required at entry for credit card in/out transactions as they are not listed on the bid form?

Answer #52: EMV readers are not required at the entry.

Question #53: Section 2.04.J Page 61 – What is the function of the lane verifiers?

Answer #53: This refers to the lane devices to re-encode tickets into the SkyLots.

Question #54: Section 2.04.M.2.d Page 65 – How many mechanicals counters are required per barrier gate?

Answer #54: None. This requirement has been removed.

Question #55: Section 2.04.M.4 Page 65 – There are no barrier gates listed for each floor of the garages on the bid form. Are barrier gates required to access each floor? If so what is the count of these barrier gates?

Answer #55: There are no gates required at each floor.

Question #56: Section 2.04.N.2 Page 65 – What size X/Arrow sign will be acceptable?

Answer #56: They should be readable from a minimum of forty-five feet.

Question #57: Section 2.04.V.1 Page 74 – Is the PARCS contractor responsible for any civil or electrical work in the Command Center?
Answer #57: GSP will provide electrical/data service to the Command Center. We do not anticipate any civil work.

Question #58: Section 2.04.V.2 Page 74 – Does the intercom video need to be recorded?

Answer #58: No.

Question #59: Section 2.04.V.3 Page 74 – Is the PARCS vendor to supply the CCTV lane surveillance cameras mentioned in this section?

Answer #59: Yes.

Question #60: Section 2.05.C. Page 79 – How many cashier stations are required for this project, there are none listed on the bid form?

Answer #60: See question #31.

Question #61: Section 3.02.F Page 86 – Will the PARCS contractor have use of any existing onsite dumpsters or will the PARCS contractor need to supply a dumpster?

Answer #61: The contractor will provide their own dumpster and dumpster service. A location will be provided for the contractor to locate their dumpster while on site. Contractor shall also provide any other services/facilities required to perform their work including port-a-john, storage, office, etc.

Question #62: The Bid Form lists Dynamic Signage for the exit lanes but there is no detailed description within the RFP for these signs. If these signs are required, please provide a detailed requirement for these signs.

Answer #62: See question/answer #27 above.

Question #63: Which document shall take precedence for required PARCS equipment, the RFP, Vendor Pricing Sheet or drawings?

Answer #63: Form 5 – Bid Form, addendums (in order of issuance), Functional Specification, RFP and drawings in that order of precedence for the purpose of pricing. Ultimately the contract will take precedence once the contractor is selected.
Question #64: We understand that the Cover Page, Letter of Transmittal, TOC and Appendix do not count toward the page count of 20 single-side pages. If a Cover Letter and Executive Summary are included in the bid response, would they be excluded from the page count as well?

Answer #64: No.

Question #65: May Report Samples, and all required Forms (including Pricing Forms) be included within the Appendix and be excluded from the page count restriction?

Answer #65: Yes.

Question #66: If the airport’s intent is to replace the existing valet system, what functionality is required?

Answer #66: Per the Functional Specification we are interested in an integrated valet system proposed by the PARCS offeror.

<table>
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<tr>
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<th>Entry Device</th>
<th>Exit Device</th>
<th>Cashier Exit Lane</th>
<th>SkyLot Lanes</th>
<th>AVI</th>
<th>Slip Lane</th>
<th>Bus Lanes</th>
<th>Total</th>
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<td>2</td>
<td></td>
<td>1</td>
<td></td>
<td>7</td>
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<td>1(east)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
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<tr>
<td>After Garage B&amp;C</td>
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<td>3</td>
<td>1</td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
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<td></td>
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<td>18</td>
<td>2</td>
<td>3</td>
<td>53</td>
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</tbody>
</table>

Note: Bus lanes are bi-directional. Also, the employee lot bus lane requires a nineteen-foot long gate arm.

Garage A – RAC will be converted in November 2022 once Garages B&C work is complete.

The Cashier Exit Lane numbers are figured within the Exit Device totals.
Attachments:
Attachment A: Form of Agreement
Attachment B: Employee Lot drawings, dated 8/14/2019
   Economy Lot B and C drawings, dated 8/14/2019
Attachment C: Form 5 – Bid Form, dated 8/28/2019
Attachment D: GSP Technology and Security Design Standards

END OF ADDENDUM 2
PROFESSIONAL SERVICES AGREEMENT
(NON-A&E RELATED)

FOR

PARKING ACCESS and CONTROL REVENUE SYSTEM
(PARCS)

GREENVILLE-SPARTANBURG AIRPORT DISTRICT

AND

Effective Date:

__________________________
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GREENVILLE-SPARTANBURG AIRPORT DISTRICT
PARKING ACCESS and REVENUE CONTROL SYSTEM AGREEMENT

THIS AGREEMENT, made effective as of the ___ day of _________ 2019, among the GREENVILLE-SPARTANBURG AIRPORT DISTRICT (herein referred to as the “District”), a body politic created an existing under the laws of the State of South Carolina, whose mailing address is 2000 GSP Drive, Suite 1, Greer, South Carolina, 29651, and TBD, a TBD (herein referred to as the “Contractor”), whose mailing address is TBD.

WITNESSETH:

WHEREAS, District desires to obtain the services of the Contractor to provide Parking Access and Revenue Control System (PARCS) and related services; and

WHEREAS, Contractor has represented to the District that it is qualified, competent, and has the experience and expertise to provide such services through Contractor’s response to the Request For Proposal dated July 29, 2019, and Contractor desires to provide such services to the District; and

WHEREAS, the District seeks to enter into an agreement with the Contractor to provide such services

NOW THEREFORE, in consideration of the mutual covenants, terms, conditions, privileges, obligations, and agreements herein contained, the parties herby mutually undertake, promise, and agree and as follows:

SECTION 1.0 SCOPE OF SERVICES

1.1 GENERAL SCOPE OF SERVICES

Subject to terms and conditions set forth in this Agreement, the Contractor shall furnish all labor, supervision, submittals, materials, equipment, and any other necessary items to provide, install, sequence, service, host, and maintain a fully functional Parking Access and Revenue Control System (PARCS) that is further described in Attachment A, Functional Specifications (Dated 7/29/2019), Attachment B, Bid Form (dated 7/29/2019), and any addendum issued as a result of the proposal process is made a part of this Agreement.

1.2 TERM OF AGREEMENT

This Agreement shall commence as of the effective date written above and shall continue until the project is fully implemented based on the following schedule for each parking lot:

A.  Phase 1
   i.  Employee Lot: March 2020
   ii. Economy Lot B & C: October 2020
   iii. Test/Confirm KPI’s: November 2020
B. **Phase 2**
   i. Economy Lot A: March 2021
   ii. Garage A: April 2021
   iii. Garages B & C: September 2022
   iv. Garage A RACS Lances: November 2022

1.3 **CHANGES IN SCOPE OF SERVICES**

The District reserves the right to modify this Agreement to meet its needs whenever necessary or advisable. The Contractor agrees that any work identified during the project as outside of the original Scope of Services shall be negotiated with the District prior to execution of such work. A separate written scope and fee will be prepared and forwarded to the District for consideration. Upon acceptance by the District for separate work to be completed by the Contractor, a change order will be executed by both parties. If the District requires a change, the following shall occur prior to commencement of any additional services:

A. **Cost Proposal**

   Upon request by the District, the Contractor shall submit a written statement of cost or cost reduction with respect to the proposed change in services. The Contractor may initiate a change in scope and submit a written statement of cost or cost reduction if the Contractor demonstrates that such a change to the current scope of services provides for additional operational efficiencies to the work that warrant consideration for the change.

B. **Change Order**

   A written change order describing the change in services shall be provided by the District. The change order must be executed by both parties prior to commencement of services. All changes will be incorporated into an amended agreement and reflected in Attachment A and Attachment B. Under no circumstances shall the Contractor unilaterally make a change to the scope of services without the District’s prior authorized consent and approval.

The Contractor shall not be entitled to payment for any service or work other than those set forth in Attachment A and Attachment B. Any work completed by the Contractor outside of the scope of services of this Agreement without express written prior approval from the District shall be considered the Contractor’s responsibility and the District shall not be required to pay for such work.

1.4 **RECORDS RETENTION**

The Contractor shall make available to the District’s authorized representative all records created as a result of the Agreement including pertinent information which Contractor shall have kept in conjunction with this Agreement. Contractor agrees to maintain a copy of said records for a minimum of six (6) years following completion of its services in accordance with District Policy.
1.5 NOTICES

All notices or communications required under this Agreement shall be addressed to the following representatives:

District Representative
David N. Edwards, President/CEO
Greenville-Spartanburg Airport District
2000 GSP Drive
Greer, SC 29651
dedwards@gspairport.com
864.848.6260

Contractor Representative
TBD

Neither party’s representative shall be changed without ten (10) days’ notice to the other party.

SECTION 2.0 PAYMENT TERMS

2.1 COMPENSATION

The District shall pay Contractor for the performance of work in accordance with the Scope of Services further described in Attachment A. The negotiated lump sum price for said services shall be $XXXX as set forth in Attachment B. The not to exceed value shall include the PARCS design, installation, sequencing, warranty, and maintenance period following acceptance by the District for a successful Owner’s Acceptance Test of all parking lot areas.

2.2 PAYMENT TERMS

Invoices shall be payable thirty (30) calendar days after receipt of a valid invoice by the District.

A. Invoicing

The Contractor shall prepare all invoices in a form satisfactory to the District. Each invoice that is submitted for payment shall be accompanied by documentation supporting each item of cost in accordance with Attachment B. Any invoice submitted, which fails to comply with the terms of this Agreement may be returned to the Contractor. Any costs associated with the resubmission of a valid invoice shall be the responsibility of the Contractor.

B. Invoicing Instructions

i. The Contractor shall submit consecutively numbered invoices, clearly displayed at the top of each page.

ii. Contractor’s invoices shall indicate the time period during which the Work was performed and for which the invoice is submitted.

iii. The invoices shall be addressed to the District as set forth at the beginning of this Agreement.
iv. The cut-off date to submit invoices to District shall be the 15th day of each month. The District will accept invoices up to five (5) calendar days after the cut-off date. Invoices submitted beyond the five (5) calendar day grace period may be paid an additional thirty (30) days later than the payment terms set forth in this Agreement.

v. A partial release of lien shall be submitted with each pay app for the subsequent pay period. A full and final release of lien shall be provided upon submittal of the final invoice.

C. Final Invoice

The Contractor’s final invoice shall be accompanied by a final payment release (Exhibit A). The final payment release shall state the full amount of compensation for the project, the amount of compensation already paid to the Contractor including claims to be due, and the remaining balance owed to the Contractor which shall reflect that the Contractor has received full compensation for all services pursuant to this Agreement upon payment of such invoice by the District.

i. The final invoice shall be submitted by the Contractor within thirty (30) days after the date of completion of services.

ii. The Contractor’s acceptance of payment of the final invoice shall release the District of any and all claims and payments due or claimed to be due under this Agreement.

SECTION 3.0 GENERAL PROVISIONS

3.1 SUBMISSION OF AGREEMENT

The submission of this document for examination and negotiation does not constitute an offer or Agreement. This document shall become effective and binding only upon execution and delivery hereof by an authorized representative of the District and the Contractor. No act or omission of any officer, employee or agent of the District shall alter, change or modify any of the provisions hereof.

3.2 QUALITY OF SERVICES

Contractor warrants to District that all services provided by the Contractor in performance of this Agreement shall be supplied by personnel who are careful, skilled, experienced and competent in their respected profession. The Contractor agrees that it is providing installation and maintenance of equipment and professional services in the performance of this Agreement and warrants to the District that the Contractor will observe the highest professional standards and principles.

3.3 SERVICES OF CONTRACTOR

Unless this Agreement is terminated as specified herein by reason of substantial failure of the Contractor to fulfill its obligations under this Agreement, the Contractor shall perform all services specified in this Agreement.
3.4 SCHEDULE, COORDINATION AND REPORTING

District will schedule, and coordinate performance of the services and the Contractor agrees to comply strictly with such scheduling and coordination. The Contractor shall promptly submit to the District such schedules and reports pertaining to the Contractor's performance of the Work, as may be required by this Agreement.

3.5 INDEPENDENT CONTRACTOR

Nothing contained herein shall be deemed or construed as creating the relationship of principal and agent, partnership, or joint venture, and no provision contained in this Agreement nor any acts of the Contractor and the District shall be deemed to create any relationship other than the Contractor serving as an independent contractor to the District.

A. Relationship of the Parties

Neither party is an employee, agent, or partner of the other. Neither party has the right or ability to bind the other to any agreement with a third party or to incur any obligation or liability on behalf of the other party.

3.6 ANTI-KICKBACK PROVISION

No officer or employee of the District, having the power or duty to perform an official act or action related to this Agreement shall have or acquire any interest in the Agreement, or have solicited, accepted or granted a present or future gift, favor, service or other thing of value from or to any person involved in this Agreement.

3.7 EQUAL OPPORTUNITY

The Contractor is referred to and shall comply with all applicable provisions, if any, of Title 41, Part 60 of the Code of Federal Regulations, including but not limited to Sections 60-1.4, 60-4.2, 60-4.3, 60-250.5(a), and 60-741.5(a), which are hereby incorporated by reference.

3.8 CIVIL RIGHTS PROVISIONS

A. Compliance with Regulations

The Contractor shall comply with the Regulations relative to nondiscrimination as further described in Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the "Regulations"), which are herein incorporated by reference and made a part of this Agreement.

B. Nondiscrimination

The Contractor, with regard to the work performed by them during the Agreement shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The Contractor shall not participate
either directly or indirectly in the discrimination prohibited by Section 21.5 of the Regulations, including employment practices when the Agreement covers a program set forth in Appendix B of the Regulations.

SECTION 4.0   TERMS AND CONDITIONS

4.1 GOVERNING LAW

This Agreement and any dispute, claim, or controversy relating to this Agreement, and all the rights and obligations of the parties shall, in all respects, be interpreted, construed, enforced and governed by and under the laws of the State of South Carolina.

4.2 LEGAL CLAIMS AND ATTORNEY FEES

Each party hereto shall promptly report to the other any claim or suit against it arising out of or in connection with the Contractor’s duties. The District and the Contractor each have the right to compromise and defend the same to the extent of its own interest; provided the defense of the same has not been tendered and accepted by the other party. The Contractor is an independent contractor in every respect, and not the agent of the District.

4.3 OWNERSHIP OF DOCUMENTS

Documents, Specifications and other data prepared by the Contractor for this Project shall become the sole property of the District. The Contractor shall, at its own cost and expense, be permitted to retain copies thereof for its records.

4.4 TERMINATION

A.  Termination for Convenience

i. The District may, by written notice, terminate this Agreement for its convenience without cause or default on the part of the Contractor. Upon receipt of such notice services shall be immediately discontinued (unless the notice directs otherwise) and all materials, data, drawings, specifications, reports, estimates, calculations, summaries and support material as may have been accumulated during performance of this Agreement, whether completed or in progress, must be delivered to the District without additional costs.

ii. The District agrees to make just and equitable compensation to the Contractor for satisfactory work completed through the date of termination by written notice. The Contractor is not entitled to anticipated profits on unperformed services after the date of termination.

B.  Termination for Default

i. This Agreement may be terminated by the District if the Contractor fails to fulfill its obligations that are essential to the completion of the work in accordance with the terms and conditions of this Agreement.
ii. The District shall provide seven (7) calendar days advance written notice of its intent to terminate the Agreement. The notice must specify the nature and extent of the breach, conditions to cure the breach, and the effective date of the termination action. The rights and remedies in this clause are in addition to any other rights and remedies provided by law or under this agreement.

4.5 **RIGHTS AND REMEDIES**

The District’s rights and remedies as set forth herein shall be in addition to any other right or remedy now and hereafter provided by law. All rights and remedies shall be cumulative and not exclusive of each other. No delay by the District in exercising a right or remedy shall constitute a waiver or acquiescence thereof.

4.6 **INSURANCE**

The Contractor shall, at its sole expense, obtain and maintain for the duration of the Agreement, insurance of the following types protecting the District and Contractor (including, without limitation, all members of the governing board of District), officers, agents and employees of each, from and against any and all liabilities arising out of or relating with limits not less than those set forth below. All liability policies shall be primary and non-contributory.

A. **Commercial General Liability Insurance**

The minimum limits for the duration of this contract shall be as follows:

i. $1,000,000 each occurrence for bodily injury and property damage combined;

ii. $1,000,000 each occurrence for personal and advertising injury; and

iii. $1,000,000 annual general aggregate

B. **Worker’s Compensation and Employers Liability Insurance**

The Contractor shall keep in force, at its sole expense, worker’s compensation or similar insurance affording the statutory coverage as required by the State of South Carolina including occupational illness or disease coverage, with a minimum limit of $1,000,000 per accident and, for bodily injury by disease, $1,000,000 per employee.

C. **Automobile Liability Insurance**

While conducting field audit work on-site, Contractor shall maintain automobile liability insurance for all owned, non-owned and hired automobiles with a minimum combined single limit of liability for bodily injury and property damage of $1,000,000 per occurrence.

D. **Products-Completed Operations Insurance**

The Contractor shall, at its sole expense, obtain and maintain for the duration of the contract, Products-Completed Operations insurance in an amount not less than $5,000,000 per occurrence for damages including injury and property damage that arises out of the Contractor’s product or work.
E. Professional Liability Insurance
The Contractor shall, at its sole cost, obtain and maintain for the duration of the contract, Professional Liability insurance in an amount not less than $1,000,000 for each claim for damages caused by any negligent act, error or omission by Contractor, or of any other person retained or engaged by Contractor for the performance of services in a professional capacity pursuant to this agreement.

F. Waiver of Subrogation
The Contractor is fully and solely responsible for any physical loss or damage to all personal property utilized in the performance of the Contractor’s work. The Contractor agrees to waive its rights of recovery and cause its insurers to waive their rights of subrogation against District for any such damage or loss, howsoever caused. The Contractor shall include the District, its Commissioners, officials, agents, and employees as additional insured by including the following statement on its insurance certificate:

“Greenville-Spartanburg Airport District, its Commissioners, officials, agents, and employees are named as additional insureds.”

G. Indemnity
The Contractor agrees and does hereby undertake to release, indemnify, defend and hold harmless the District and its present and future Commissioners, officers, agents and employees and assigns of each from and against any and all liabilities, damages, claims, losses, suits, fines, theft, demands, penalties and actions of every kind and description (including any and all attorneys’ fees, costs and expenses related to the defense thereof) to the extent caused by, arising out of or resulting from the negligent acts or omissions of the Contractor, its directors, officers, employees, Sub Contractors and agents in connection with the performance of this Agreement. All indemnities provided in this Agreement shall survive the expiration or any termination of this Agreement.

H. Unconditional Coverage
The certificate shall unconditionally provide that the requisite coverage shall not be terminated or adversely modified or not renewed until the District has received thirty (30) days written notice thereof. In the event that an insurance carrier should terminate or adversely modify or not renew the above coverage, the Contractor shall immediately contract with another insurance carrier to provide requisite coverage and shall ensure that there is no gap or reduction in coverage and shall immediately deliver to the District a replacement certificate.

4.7 ACCESS, APPROVALS, AND PERMITS
The District shall arrange for access to and make all provisions for the Contractor to enter Airport property as required for the Contractor to perform the scope of services described in Attachment A. Except as may be provided in individual
agreements, the District shall furnish appropriate approvals and permits from all governmental authorities having jurisdiction over the project and such approval and consents from others as may be necessary for completion of the project.

A. Authorization to Proceed

The Contractor shall not begin work on any of the services listed in this Agreement until the District provides written notice to proceed.

4.8 ASSIGNMENT, NOVATION, AND CHANGE OF NAME

A. Assignment

No agreement, contract or purchase order awarded by the District is transferable, or otherwise assignable, without written consent of the President/CEO or designee. However, the Contractor may assign monies receivable under this Agreement after adequate notice is provided to the District.

B. Novation

The District shall recognize a successor in interest of transfer in a novation agreement in which the transferor and the transferee agrees that:

i. The transferee assumes all of the transferor’s obligations including performance of the work for a contract and all commercial and legal liabilities associated with the transferor;

ii. The transferor waives all rights under the contract against the District; and

iii. Unless the transferor guarantees performance of the contract through the transferee, the transferee shall furnish a satisfactory performance bond, if required.

C. Change of Name

If the Contractor elects to change its name during the performance of work for this project, the Contractor must submit a request to the District. The request must be accompanied by supporting documentation of the name change, such as amended articles of incorporation. After receiving the request and supporting documentation, the District may enter into an agreement with the requesting contractor to effect such a change. The new agreement shall specify that changing the name did not alter the terms and conditions of the original contract.

4.9 SEVERABILITY

If any of the terms, conditions or provisions of this Agreement hereto, or any document incorporated herein (other than a Regulation) or any portions thereof, shall contravene or be invalid under the laws or regulations of the United States or the State of South Carolina or any of their respective agencies, departments or subdivisions, such contravention or invalidity shall not invalidate the entire Agreement, attachment or document, but this Agreement, attachment(s), and document(s) shall be construed as if not containing the particular term, condition
or provision, or portion thereof, held to be in contravention or invalid, and the rights and obligations of the parties hereto shall be construed accordingly.

4.10 **FORCE MAJURE**

Neither District or Contractor shall hold the other responsible for damages nor delay in performance caused by acts of God, strikes, lockouts, accidents, or other events beyond the control of the parties’ employees and agents.

4.11 **DEBARMENT AND SUSPENSION**

Contractor certifies, by execution of this Agreement, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. It further agrees by executing this Agreement that it will include this clause without modification in all lower tier transactions, solicitations, proposals, contracts, and subcontracts. Where the Contractor or any lower tier participant is unable to certify to this statement, it shall attach an explanation to this Agreement.

4.12 **ENTIRETY OF AGREEMENT**

This Agreement, together with all attachments hereto, constitutes the entire agreement between the parties for the scope of services described in Attachment A. This Agreement supersedes all prior and contemporaneous agreements, whether written or oral, between the parties in connection with such subject matter. This Agreement may be modified only by written agreement between the Contractor and the District.

IN WITNESS WHEREOF, the parties hereto by their duly authorized officers have caused this Agreement to be executed in their names and their seals to be affixed hereto as of the day and year first above written.
**DISTRICT:**
Greenville-Spartanburg Airport District

By:

Printed Name: David N. Edwards Jr., A.A.E
Title: President/CEO
Attested By:

---

**CONTRACTOR:**

By:

Printed Name: 
Title: 
Attested By:

---

Attachments:
- Addendum #1, dated 8/18/2019
- Addendum #2, dated 8/28/2019
- PARCS Functional Specification, dated xx/xx/2019
- PARCS Project Timeline, dated xx/xx/2019
- PARCS Form 5 – Bid Form
- Certificate of Insurance
- Drawings, dated xx/xx/2019
# Greenville-Spartanburg International Airport

## Replacement for Parking Access Revenue Control System (PARCS) Project

### Form 5 - Bid Form

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<th>Unit Cost</th>
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| **Economy Lot B Total** | $ | - |
### Greenville-Spartanburg International Airport
**Replacement for Parking Access Revenue Control System (PARCS) Project**

**Form 5 - Bid Form**

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# Greenville-Spartanburg International Airport
## Replacement for Parking Access Revenue Control System (PARCS) Project

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### Greenville-Spartanburg International Airport

Replacement for Parking Access Revenue Control System (PARCS) Project

**Form 5 - Bid Form**

**Date:** 28-Aug-19

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### Greenville-Spartanburg International Airport
#### Replacement for Parking Access Revenue Control System (PARCS) Project

**Form 5 - Bid Form**

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**Applicable Sales Tax Phase 2**

**Total Phase 2**

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Note 1: The offeror is responsible for the accuracy of the spreadsheet. If errors occur, decision will be rendered in favor of GSP.

Note 2: The offeror's fee, bonds, overhead, insurance, and miscellaneous expenses/charges are to be incorporated into the unit costs above.
Introduction

PURPOSE OF THIS DOCUMENT

The intent of this document is to disseminate Greenville-Spartanburg International Airport’s (GSP) expectations regarding the design standards presented to designers, engineers, general contractors and other industry specialists. The material provided in the following sections includes the minimal requirements, general information, design criteria, guide specifications and details for the Information Technology (IT) Department, Operations and Police Department at GSP. While this document addresses major areas of concern to GSP, it is not an all-inclusive document.

HOW TO USE THIS DOCUMENT

This document should be used as a resource for the development of project-specific design documents including drawings, details and specifications. It is the responsibility of the design, engineering and construction professionals to adhere to all applicable codes and regulations related to the content presented.

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### b. System Architecture

## 2. EXISTING SYSTEM DESCRIPTION

### a. Manufacturer and Model

### b. System Architecture

## 3. SOFTWARE AND SYSTEM REQUIREMENTS

### 4. HARDWARE REQUIREMENTS

#### a. General

#### b. Agent Facing Positions – Ticketing Counters

#### c. Agent Facing Positions – Gate Counters

#### d. Self-Service Kiosks

## 5. SYSTEM INTERFACES AND FEATURES

## 6. NETWORK (IP) CONNECTIVITY

## 7. CABLING

### 8. TESTING

### 9. NETWORK (IP) CONNECTIVITY

### 10. CABLING

### 11. TESTING

# ACCESS CONTROL SYSTEM (ACS)

## 1. GENERAL REQUIREMENTS

### 2. SECURED Identification DISPLAY AREA (SIDA) LINE

### 3. EXISTING SYSTEM DESCRIPTION

#### a. Manufacturer and Model

#### b. System Architecture

### 4. APPROVED Security INTEGRATOR AND Security ALLOWANCE

#### a. Access Control Panels

#### b. Input/Output Modules

#### c. Power Supply and Battery Back-up

### 5. SECURED DOOR HARDWARE

#### a. Electrified Locking Door Hardware

#### b. Door Hardware Power Supply

#### c. Card Readers

#### d. Door Position Switches

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### Abbreviations & Definitions

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<th>Abbreviation</th>
<th>Definition</th>
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<tr>
<td>AOA</td>
<td>Airfield Operations Area</td>
</tr>
<tr>
<td>AOC</td>
<td>Airport Operations Center</td>
</tr>
<tr>
<td>ACS</td>
<td>Access Control System</td>
</tr>
<tr>
<td>AFF</td>
<td>Above Finished Floor</td>
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<tr>
<td>BAS</td>
<td>Building Automation System</td>
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<td>BER</td>
<td>Bit Error Rate.</td>
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<tr>
<td>BHS</td>
<td>Baggage Handling System</td>
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<tr>
<td>BICSI</td>
<td>Building Industry Consulting Service International</td>
</tr>
<tr>
<td>BMS</td>
<td>Building Management System</td>
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<tr>
<td>Cable Runway</td>
<td>Constructed of rectangular steel tubing and used for the distribution of low voltage cables within MDF and IDF Rooms</td>
</tr>
<tr>
<td>Cable Tray</td>
<td>Constructed of welded steel wire and used for the distribution of low voltage cables between MDF and IDF Rooms and to field devices</td>
</tr>
<tr>
<td>CAT</td>
<td>Category, as in CAT 6 cable</td>
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<td>CATV</td>
<td>Cable TV.</td>
</tr>
<tr>
<td>CCTV</td>
<td>Closed Circuit TV (in relation to security)</td>
</tr>
<tr>
<td>CP</td>
<td>Consolidation Point. An intermediary point where more permanent horizontal cables are terminated to connect to cables that get moved a lot through moves, adds, and changes.</td>
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<tr>
<td>CRAC</td>
<td>Computer Room Air Conditioning Unit</td>
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<tr>
<td>Cross-Connect</td>
<td>The connection of two cables, patch panels, or pieces of equipment.</td>
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<tr>
<td>DAS</td>
<td>Distributed Antenna System. A network of antennas sharing a common infrastructure for wireless communications.</td>
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<tr>
<td>EMI</td>
<td>Electromagnetic Interference.</td>
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<td>Field Device</td>
<td>A piece of equipment that needs to connect to an IT room. Examples include ACAMS card readers, cameras, paging microphones, speakers, monitors, work stations, elevator/escalator sensors, etc.</td>
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<tr>
<td>FACP</td>
<td>Fire Alarm Control Panel</td>
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<td>Fiber Optic</td>
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<td>GSM</td>
<td>Global System for Mobiles</td>
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<td>GSP</td>
<td>Greenville-Spartanburg International Airport</td>
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<tr>
<td>HH</td>
<td>Underground Hand Holes.</td>
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</table>
Head-End: A piece of equipment, typically a server, that has applications that field devices interact with.

IDF: Intermediate Distribution Frame

IT: Information Technology.

KW: Kilowatt

MDF: Main Distribution Frame

MEP: Mechanical, Electrical, and Plumbing.

MPOE: Minimum Point of Entry where a Service Provider enters a building. Also a space where backbone cables cross-connect to horizontal cables to serve work areas and may have active equipment. Also known as Entrance Room (ER)

nm: Nanometers.


OTDR: Optical Time Domain Reflectometer.

PDU: Power Distribution Unit

RMU: Rack Mounting Unit

SIDA: Secure Identification Display Area

SIM: Subscriber Identity Module

TIA: Telecommunications Industry Association.

TGB: Telecommunications Grounding Busbar.

TSA: Transportation Security Administration

UG: Underground.

UPS: Uninterruptible Power Supply.

UTP: Unshielded twisted pair

VA: Volt-Amps

WAO: Work Area Outlet.

WDM: Wave Division Multiplexing. Also known as CWDM (Coarse Wave Division Multiplexing) or DWDM (Dense Wave Division Multiplexing).
Telecommunication Rooms

1. Main Point of Entry / Entrance Rooms (ER)
   a. General Requirements
      i. Main Point of Entry / Entrance Rooms (ER) shall be a dedicated space where public and private networks enter the building. The ER includes the entrance wall and the entrance room/space. All Service Provider cables terminate in the ER at a point called the demarcation (demarc) point. The demarc is the point of hand-off to GSP or the Tenant.
      ii. Depending on the size of the building and its purpose, the ER may occupy the same space as the Main Distribution Frame (MDF) Room. Consult with GSP IT for these requirements.
      iii. When outdoor cables enter the building, local codes must be followed in transitioning to indoor cables. The use of conduit may extend the distance outdoor cable may be brought into the building.
      iv. Generally, each building will be provided with an ER. ERs shall be connected to the outside plant backbone pathways that run between buildings. Buildings outside the terminal area may only require one ER that may or may not contain active equipment. For example, Terminal Area ERs will have active equipment and Cargo Area ERs will only have passive equipment.
      v. The ER shall be dedicated to data and telecommunications functions, and shall not be shared with other services such as electrical rooms, mechanical rooms, storerooms, office space, etc. ER shall be designed and provisioned according to the requirements in ANSI/TIA-569-D.
   b. Design Requirements
      i. Physical Location Requirements
         1. The ER shall not be located in a basement or sub-grade level of the building. Where practical, the ER be located as close to the exterior wall where the outdoor conduits enter the building.
         2. The ER final size shall be determined by the type of area to be served, square footage of the area being served and the quantity and type of equipment being housed in the room. For general planning purposes, the minimum size of an ER within a new building area shall be 16’ by 16’ capable of supporting a minimum of 2 enclosed equipment cabinets and 2 open frame equipment racks. Existing buildings shall be evaluated on project by project basis. In addition to cabinets and racks, floor space shall accommodate a dedicated computer room air-conditioning unit (CRAC), fire protection equipment and a dedicated UPS. Cabinets and racks within the facility shall be separated by at least 4’ of clearance front and back between other racks, and wall mounted equipment, and 6’ of clearance if doors to cabinets swing into the same space.
         3. After review of the conceptual design for a new facility, cabinets and rack counts shall be adjusted to support at least 25% future capacity for equipment within the space. This 25% of future capacity should be based on empty cabinets and shall not include those cabinets which have planned needs but may not be built out on Day 1.
         4. The ER shall not be placed in areas subject to water or steam infiltration. A floor drain (with a trap primer) and/or sump pump is required if there is any risk of water entering the ER.
         5. The ER shall not to be placed:
a. Below restrooms.
b. In areas exposed to excessive heat or direct sunlight, corrosive atmospheric or environmental conditions.
c. Near equipment not related to the support the ER (e.g., sprinkler mains, steam, chilled water, supply and waste piping, ductwork, pneumatic tubing, etc.) shall not be installed within, pass through, pass overhead or enter the ER.
d. In a shared space with electrical equipment other than equipment serving the telecommunications equipment within the ER.

6. The ER may be placed:
   a. Directly adjacent to a restroom’s wet wall with suitable chases that provide separation between the shared walls. Restroom and chase shall have sufficient waterproofing measures (e.g., curbs, flashings, waterproofing membrane, drains, etc.) within the restrooms to prevent moisture entering the ER.

7. The ER shall be placed in a location that mitigates all electromagnetic interference (EMI) of radio frequency interference (RFI). If rooms must be placed near or adjacent to EMI or RFI such as large electric motors, power transformers, arc welding equipment, or high-power radio transmitting antennas provided that exterior walls of the ER shall be located no less than 4’ from electrical equipment rated at 5 KVA and above. All distances must comply with TIA/EIA 569. If this cannot be achieved as a part of the design, then mitigating measures must be implemented to prevent interference.

ii. Architectural
   1. Doors: 4’ wide by 8’ tall, minimum, single-door, out-swinging where practical without doorsills. Door height may be reduced to 7’ tall if ceiling height is limited.
   2. Flooring: Bare concrete floor that is sealed with an effective static control sealer. Sealer shall reduce dusting and simplify maintenance producing a cleaner and healthier environment. The use of anti-static rubber, carpet tiles or ESD tiles shall not be allowed.
   3. Ceiling: Ceiling height shall be based upon the required space above the cabinets and ladder racks. At a minimum, 12” of space shall be provided between cabinets and IDF ladder racks and 24” of clear space above the top of the IDF ladder rack. A suspended or finished ceiling shall not be provided. If a ceiling finish is required, the finish should minimize dust and be light in color for additional brightness in the room. If fireproofing materials are present, proper sealing techniques shall be used to prevent material falling from the ceiling.
   4. Walls: Ideally walls shall be full height partition (slab-to-deck) construction and have a 1-hour fire rating. Glass and windows shall not be used in exterior walls and/or doors. Walls shall be covered with fire rated backboard painted white with fire retardant paint on all six sides leaving the fire rating stamp exposed. Backboard shall start 12” above finished floor and extend 8’ high, minimum.

iii. Environmental Control
   1. Heating Ventilation and Air Conditioning (HVAC) must be provided to the ER 24 x 7 x 365 days.
   2. Within the Terminal area served by the Central Plant, dual cooling systems shall be provided. The primary system will be a dedicated CRAC unit, without exterior ducting within the room. The stand-by system shall be a DX split system not supported or
connected to the Central Plant. This will ensure constant cooling regardless of the Central Plant status.

3. Once equipment has been defined for each ER, a heat load calculation will be generated. The following are guidelines:
   a. Temperature: 64 to 75 °F (18 to 24 °C), maintained
   b. Humidity: 30% to 55% RH.
   c. Heat Dissipation: 1.5 kW to 3.5 kW per cabinet/rack for conventional switches.
   d. Control: positive pressure (5 to 10 CFM above exterior corridor) maintained with a minimum of one air change per hour.

4. HVAC system serving the ER should be connected to the emergency power source. The back-up HVAC equipment shall be connected to the emergency power in the case of the loss of the primary CRAC unit.

iv. Fire Protection

1. Fire protection of the ER shall be provided as per local building codes. Within terminal buildings and critical structures, pre-action sprinkler systems shall be provided. Outside the terminal area and in non-critical structures (e.g., cargo buildings and parking garages), traditional wet pipe fire sprinkler systems are acceptable when the ERs are not being used as a main hub or MDF for the surrounding area. In addition, any service impact has been identified by the project team and approved by GSP IT to determine that the amount and value of equipment does not require a pre-action system. Locate all sprinkler heads centered over the aisle or wall mounted and never above the cabinets and/or racks. All sprinklers shall be installed with a red-colored, heavy-duty guard.

v. Electrical

1. Cable Runway: Provide a 24” cable runway centered above each cabinet and along perimeter walls in a racetrack style layout. Maintain a maximum 12” height above cabinet. Equipment cabinets shall be provided with an integral cable runway on top of cabinets to assist in training of patch cables across top of cabinets. Overhead cable runway is not to be utilized for patch cables.
   a. Wire Basket Tray for Fiber Optic Patch Cords: Provide a wire basket tray attached to the side of the cable runway for routing of fiber optic patch cords and jumpers between racks and cabinets. The wire basket tray shall run continuously between all racks and cabinets. If there is a need to extend fiber optic patch cords to wall mounted equipment the wire basket tray shall extend to above the wall mounted equipment. Wire basket tray shall be sized to support the total quantity of fiber optic strands terminated on Day 1 plus an additional 100% spare capacity. Minimum size of wire basket tray shall be 4” wide by 4” deep.

2. Fire-Rated Pathway: Provide a fire-rated pathway at all ER wall penetrations where cables need to transition from outside the ER to the cable runway inside the ER. Provide fire-rated pathways by STI (EZ Path) or Hilti (Firestop Speed Sleeve) sized to support the ER cable runway capacity and not just the cables to be installed on Day 1. Fire-rated pathways shall also be used for all ER floor and ceiling penetrations.

3. Grounding: All equipment and raceways will be grounded per ANSI/TIA-607-C. Telecommunication ground bars will be provided in each ER for grounding connections. See Telecomm Grounding System section of this standard.
4. Lighting: 50 foot-candles (fc) at 3’ AFF, average. Lighting fixtures shall be distributed uniformly above the aisles between racks/cabinets and not be located above the racks/cabinets. Lights shall be controlled via occupancy sensor and connected to emergency power.

5. Power: Power for the ER shall be closely coordinated to support the needs of the service providers as well as GSP. Uninterruptable power (battery rack) may be required or provided by the service provider for their specific equipment. In addition, a UPS may be required to support GSP equipment inside the ER. UPS shall be fed from emergency generator backed feeders with batteries sized to provide a minimum of 15 minutes of runtime at full load. UPS shall be sized for all equipment inside the ER plus a minimum of 30% spare capacity depending on future requirements. UPS-backed power panel should be installed inside the ER to serve equipment within the ER. When emergency power is unavailable, the battery sizing for runtime at full load shall be at least 4 hours.

6. Cabinet and Open Frame Rack Power: Power for cabinet and racks will need to be coordinated with the service provider in order to provide the proper voltage and receptacle types at each cabinet/rack. At minimum, each open frame rack shall be provided with two 120V, 30A, single phase twist-lock receptacles mounted above the rack. Each equipment cabinet shall be provided with a minimum of two 208V, 30A, single-phase twist-lock receptacles mounted above the cabinet. Each receptacle shall be on a dedicated circuit. See Power Distribution (PDU) section of this standard for distribution of power within cabinets and racks. Final power requirements per rack will be confirmed during Design Phase with GSP IT.

7. Convenience Outlets: Placed at end of every aisle and around the perimeter of room for maintenance staff to power test equipment, tools, etc. These receptacles shall be derived off normal building power and not connected to the UPS panel inside the ER.

8. Service Provider Cabling: cabling installed by the service provider shall be clearly labeled depicting the Company (Owner) of the cable, cable type and service type (TV, ISP, etc.). All active circuits identified for use by GSP shall be labeled accordingly both in the MPOE and in the MDF.

vi. Security

1. ER entry doors shall be equipped with electrified locking device and proximity card reader for control and monitoring by the GSP Access Control System (ACS).

2. CCTV cameras shall be provided for on the entry door into the ER and viewing equipment cabinets holding GSP LAN equipment. The use of 360° cameras should be investigated to provide coverage of the cabinet/rack aisles.

3. At a minimum, provide a voice wall phone drop location installed at 48” AFF near the entry door.

2. Main Distribution Frame (MDF) Rooms
   a. General Requirements
      i. MDF Rooms shall be a dedicated space for telecommunications equipment typically housing network equipment (i.e., core switch/router, distribution switches, processing equipment/servers, access switches, edge, switches), voice system equipment, inter-building and intra-building twisted pair and fiber optic backbone cabling and main cross-connect field and horizontal termination fields for voice/data work-area outlets served from this room.
ii. Only Airport-owned equipment and systems will be located in the MDF. Tenant-owned equipment may only be located in the MDF upon review and approval from GSP IT. If tenant-owned equipment is allowed in the MDF it shall be installed in a dedicated equipment cabinet as specified elsewhere in this standard.

iii. As identified under the Main Point of Entry / Entrance Rooms (ER) section of this standard, the MDF may also act as the ER for the building housing public and private network equipment. All equipment dedicated to service provider networks shall be located in dedicated equipment cabinets or wall enclosures.

iv. Generally, each building will be provided with an MDF Room. Larger buildings may require a Primary MDF and a Secondary MDF to support diverse cabling topologies as well as redundant networks/systems. The MDF shall be connected to the backbone pathways that run within and between buildings.

v. The MDF shall be dedicated to data and telecommunications functions, and shall not be shared with other services such as electrical rooms, mechanical rooms, storerooms, office space, etc. MDF shall be designed and provisioned according to the requirements in ANSI/TIA-569-D.

b. Design Requirements
   i. Physical Location Requirements
      1. The MDF shall not be located on basement or sub-grade levels of the building, and where practical, be located as close to equidistant from exterior walls of both sides of the building.
      2. The MDF final size shall be determined by the type of area to be served, square footage of the area being served, number of end user workstations/devices being served, and the quantity and type of equipment being housed in the room. For general planning purposes, the minimum size of a MDF within a new building area shall be 15’ by 25’ capable of supporting a minimum of 4 enclosed equipment cabinets and 1 open frame equipment racks. Existing buildings shall be evaluated on project by project basis. In addition to cabinets and racks, floor space shall accommodate a dedicated computer room air-conditioning unit (CRAC), fire protection equipment and a dedicated UPS. Cabinets and racks within the facility shall be separated by at least 4’ of clearance front and back between other racks, and wall mounted equipment, and 6’ of clearance if doors to cabinets swing into the same space.
      3. After review of the conceptual design for a new facility, cabinets and rack counts shall be adjusted to support at least 25% future capacity for equipment within the space. This 30% of future capacity should be based on empty cabinets and shall not include those cabinets which have planned needs but may not be built out on Day 1.
      4. The MDF shall not be placed in areas subject to water or steam infiltration. A floor drain (with a trap primer) and/or sump pump is required if there is any risk of water entering the MDF.
      5. The MDF shall not to be placed:
         a. Below restrooms.
         b. In areas exposed to excessive heat or direct sunlight, corrosive atmospheric or environmental conditions.
c. Near equipment not related to the support the MDF (e.g., sprinkler mains, steam, chilled water, supply and waste piping, ductwork, pneumatic tubing, etc.) shall not be installed within, pass through, pass overhead or enter the MDF.

d. In a shared space with electrical equipment other than equipment serving the telecommunications equipment within the MDF.

6. The MDF may be placed:
   a. Directly adjacent to a restroom’s wet wall with suitable chases that provide separation between the shared walls. Restroom and chase shall have sufficient waterproofing measures (e.g., curbs, flashings, waterproofing membrane, drains, etc.) within the restrooms to prevent moisture entering the MDF.

7. The MDF shall be placed in a location that mitigates all electromagnetic interference (EMI) of radio frequency interference (RFI). If rooms must be placed near or adjacent to EMI or RFI such as large electric motors, power transformers, arc welding equipment, or high-power radio transmitting antennas provided that exterior walls of the MDF shall be located no less than 4’ from electrical equipment rated at 5 KVA and above. All distances must comply with TIA/EIA 569. If this cannot be achieved as a part of the design, then mitigating measures must be implemented to prevent interference.

ii. Architectural
   1. Doors: 8’ wide by 8’ tall minimum, double-door, out-swinging (where practical) without doorsills. Door height may be reduced to 7’ if ceiling height is limited.
   2. Flooring: Bare concrete floor that is sealed with an effective static control sealer. Sealer shall reduce dusting and simplify maintenance producing a cleaner and healthier environment. The use of anti-static rubber, carpet tiles or ESD tiles shall not be allowed.
   3. Ceiling: Ceiling height shall be based upon the required space above the cabinets and ladder racks. At a minimum, 12” of space shall be provided between cabinets and MDF ladder racks and 24” of clear space above the top of the MDF ladder rack. A suspended or finished ceiling shall not be provided. If a ceiling finish is required, the finish should minimize dust and be light in color for additional brightness in the room. If fireproofing materials are present, proper sealing techniques shall be used to prevent material falling from the ceiling.
   4. Walls: Ideally walls shall be full height partition (slab-to-deck) construction and have a one-hour fire rating. Glass and windows shall not be used in exterior walls and/or doors. Walls shall be covered with 0.75” thick fire-rated backboard painted white with fire-retardant paint on all six sides leaving the fire rating stamp exposed. Backboard shall start 12” above finished floor and extend 8’ high, minimum.

iii. Environmental Control
   1. Heating Ventilation and Air Conditioning (HVAC) must be provided to the MDF 24 x 7 x 365 days.
   2. Within the Terminal area served by the Central Plant, dual cooling systems shall be provided. The primary system will be a dedicated CRAC unit, without exterior ducting within the room. The stand-by system shall be a DX split system not supported or connected to the Central Plant. This will ensure constant cooling regardless of the Central Plant status.
   3. Once equipment has been defined for each MDF, a heat load calculation will be generated. The following are guidelines:
a. Temperature: 64 to 75 °F (18 to 24 °C), maintained  
b. Humidity: 30% to 55% RH.  
c. Heat Dissipation: 1.5 kW to 3.5 kW per cabinet/rack for conventional switches.  
d. Control: positive pressure (5 to 10 CFM above exterior corridor) maintained with a minimum of one air change per hour.

4. HVAC system serving the MDF should be connected to the emergency power source. The back-up HVAC equipment shall be connected to the emergency power in the case of the loss of the primary CRAC unit.

iv. Fire Protection  
1. Fire protection of the MDF shall be provided as per local building codes. Clean agent fire protection systems are required for all MDFs. Where possible, clean agent system tanks shall be located in a separate room from the main MDF space, and accessible from the MDF. If tanks are required to be installed inside the MDF space provide proper clearance for maintenance.

v. Electrical  
1. Cable Runway: Provide a 24” cable runway centered above each cabinet and along perimeter walls in a racetrack style layout. Maintain a maximum 12” height above cabinet. Equipment cabinets shall be provided with an integral cable runway on top of cabinets to assist in training of patch cables across top of cabinets. Overhead cable runway is not to be utilized for patch cables.
   a. Wire Basket Tray for Fiber Optic Patch Cords: Provide a wire basket tray attached to the side of the cable runway for routing of fiber optic patch cords and jumpers between racks and cabinets. The wire basket tray shall run continuously between all racks and cabinets. If there is a need to extend fiber optic patch cords to wall mounted equipment the wire basket tray shall extend to above the wall mounted equipment. Wire basket tray shall be sized to support the total quantity of fiber optic strands terminated on Day 1 plus an additional 100% spare capacity. Minimum size of wire basket tray shall be 4” wide by 4” deep.
2. Fire-Rated Pathway: Provide a fire-rated pathway at all MDF wall penetrations where cables need to transition from outside the MDF to the cable runway inside the MDF. Provide fire-rated pathways by STI (EZ Path) or Hilti (Firestop Speed Sleeve) sized to support the MDF cable runway capacity and not just the cables to be installed on Day 1. Fire-rated pathways shall also be used for all MDF floor and ceiling penetrations.
3. Grounding: All equipment and raceways will be grounded per ANSI/TIA-607-C. Telecommunication ground bars will be provided in each MDF for grounding connections. See Telecomm Grounding System section of this standard.
4. Lighting: 50 foot-candles (fc) at 3’ AFF, average. Lighting fixtures shall be distributed uniformly above the aisles between racks/cabinets and not be located above the racks/cabinets. Lights shall be controlled via occupancy sensor and connected to emergency power.
5. Power: A dedicated, uninterruptable power supply (UPS) shall be provided inside the MDF. UPS shall be fed from emergency generator backed feeders with batteries sized to provide a minimum of 15 minutes of runtime at full load. UPS shall be sized for all equipment inside the MDF plus a minimum of 30% spare capacity depending on future requirements. UPS-backed power panel should be installed inside the MDF to serve
equipment within the MDF. When emergency power is unavailable, the battery sizing for runtime at full load shall be at least 4 hours.

6. Equipment Cabinet Power: Each equipment cabinet shall be provided with a minimum of two 208V, 30A, single-phase twist-lock receptacles mounted above the cabinet. Each receptacle shall be on a dedicated circuit. See Power Distribution (PDU) section of this standard for distribution of power within the MDF cabinets. Final power requirements per cabinet will be confirmed during Design Phase with GSP IT.

7. Open Frame Rack Power: Each open frame rack shall be provided with two 120V, 30A, single phase twist-lock receptacles mounted above the rack. Each receptacle shall be on a dedicated circuit. This requirement only applies if the open frame rack houses active equipment. Outlets are not required for open frame racks with passive (cable termination) equipment. See Power Distribution (PDU) section of this standard for distribution of power within the MDF racks. Final power requirements per rack will be confirmed during Design Phase with GSP IT.

8. Co-Location Cabinets (if required): If tenant co-location cabinets are required and allowed by GSP IT, provide a single, dedicated 120V, 20A receptacle inside each section of the cabinet. This receptacle shall be connected to emergency power but shall not be supported by the UPS. The tenant is required to provide any UPS requirements within their section of the co-location cabinet.

9. Convenience Outlets: Placed at end of every aisle and around the perimeter of room for maintenance staff to power test equipment, tools, etc. These receptacles shall be derived off normal building power and not connected to the UPS panel inside the MDF.

vi. Security
1. MDF entry doors shall be equipped with electrified locking device and proximity card reader for control and monitoring by the GSP Access Control System (ACS).
2. CCTV cameras shall be provided for on the entry door into the MDF and viewing equipment cabinets holding GSP LAN equipment. The use of 360° cameras should be investigated to provide coverage of the cabinet/rack aisles.
3. At a minimum, provide a voice wall phone drop location installed at 48” AFF near the entry door.

3. Intermediate Distribution Frame (IDF) Rooms
a. General Requirements
i. IDF Rooms shall be a dedicated space for telecommunications equipment typically housing intra-building twisted pair copper and fiber optic backbone cabling from the MDF Room, horizontal termination field for both voice and data outlets served from this room and network equipment (i.e., access switch) serving users of the room’s service area.
ii. IDFs are to be located in such a way as to provide complete coverage of the Building interior. Complete coverage means that the total length of a horizontal cable shall not exceed 250’ of cable length from the work-area outlet to the Cat 6 patch panel located in the IDF (this is including both vertical and horizontal distances).
iii. During the Design Phase, careful consideration should be given to unique coverage requirements based on the location of the IDF. It is recommended that designers maintain a 20% contingency when designing cabling zones and should utilize 250’ distance limitations for design. Upper level IDFs would need to provide coverage of the building roof. Designers should indicate conceptual cabling routes in a structure before settling on an IDF location.
iv. If any horizontal cable length exceeds the 250’ requirement as stated above GSP IT has the discretion on a case by case bases to provide an exception. Industry standard for maximum allowable horizontal link length of 290’ for these locations will still need to be met.

v. The IDF shall be dedicated to data and telecommunications functions, and shall not be shared with other services such as electrical rooms, mechanical rooms, storerooms, office space, etc. The IDF shall be designed and provisioned according to the requirements in ANSI/TIA-569-D.

b. Design Requirements

i. Physical Location Requirements

1. The IDF Room final size shall be determined by the square footage of the area being served, number of end user workstations/devices being served, and the quantity and type of equipment being housed in the room. For general planning purposes, the minimum size of a IDF shall be 16’ by 16’ capable of supporting a minimum of three enclosed equipment cabinets and one open frame equipment racks. In addition to cabinets and racks, floor space shall accommodate a dedicated computer room air-conditioning unit (CRAC). Cabinets and Racks within the IDF shall be separated by at least 4’ of clearance front and back between other racks, and wall mounted equipment, and 6’ of clearance if doors to cabinets swing into the same space.

2. After review of the conceptual design for a new facility, cabinets and rack counts shall be adjusted to support at least 30% future capacity for equipment within the space. This 30% of future capacity should be based on empty cabinets and shall not include those cabinets which have planned needs but may not be built out on Day 1.

3. IDFs shall not be placed in areas subject to water or steam infiltration. A floor drain (with a trap primer) and/or sump pump is required if there is any risk of water entering the IDF.

4. IDF Rooms are not to be placed:
   a. Below restrooms
   b. In areas exposed to excessive heat or direct sunlight, corrosive atmospheric or environmental conditions.
   c. Near equipment not related to the support the IDF (e.g., sprinkler mains, steam, chilled water, supply and waste piping, ductwork, pneumatic tubing, etc.) shall not be installed within, pass through, pass overhead or enter the IDF.
   d. In a shared space with electrical equipment other than equipment serving the telecommunications system.

5. IDF Rooms may be placed:
   a. Directly adjacent to a restroom’s wet wall with suitable chases that provide separation between the shared walls. Restroom and chase shall have sufficient waterproofing measures (e.g., curbs, flashings, waterproofing membrane, drains, etc.) within the restrooms to prevent moisture entering the IDF.
   b. Designers are to place IDFs in a location that mitigates all electromagnetic interference (EMI) of radio frequency interference (RFI). If rooms must be placed near or adjacent to EMI or RFI such as large electric motors, power transformers, arc welding equipment, or high-power radio transmitting antennas provided that exterior walls of the IDF shall be located no less than 4’ from electrical equipment rated at 5 KVA and above. All distances must comply with TIA/EIA 569. If this cannot be achieved as a part of the design, then mitigating measures must be implemented to prevent interference.
ii. Architectural
1. Doors: 4’ wide by 8’ tall, minimum, single-door, out-swinging where practical without doorsills. Door height may be reduced to 7’ tall if ceiling height is limited.
2. Flooring: Bare concrete floor that is sealed with an effective static control sealer. Sealer shall reduce dusting and simplify maintenance producing a cleaner and healthier environment. The use of anti-static rubber, carpet tiles or ESD tiles shall not be allowed.
3. Ceiling: Ceiling height shall be based upon the required space above the cabinets and ladder racks. At a minimum, 12” of space shall be provided between cabinets and IDF ladder racks and 24” of clear space above the top of the IDF ladder rack. A suspended or finished ceiling shall not be provided. If a ceiling finish is required, the finish should minimize dust and be light in color for additional brightness in the room. If fireproofing materials are present, proper sealing techniques shall be used to prevent material falling from the ceiling.
4. Walls: Ideally walls shall be full height partition (slab-to-deck) construction and have a 1-hour fire rating. Glass and windows shall not be used in exterior walls and/or doors. Walls shall be covered with fire rated backboard painted white with fire retardant paint on all six sides leaving the fire rating stamp exposed. Backboard shall start 12” above finished floor and extend 8’ high, minimum.

iii. Environmental Control
1. Heating Ventilation and Air Conditioning (HVAC) must be provided to the IDF 24 x 7 x 365 days.
2. A single, dedicated CRAC unit should be in each IDF, and redundancy must be provided through other practical and reliable means (dedicated DX split system, building chilled water, etc.) to be determined during the Design Phase.
3. Once equipment has been defined for each IDF a heat load calculation will be generated. The following are guidelines:
   a. Temperature: 18 to 24 °C (64 to 75 °F), maintained
   b. Humidity: 30% to 55% RH.
   c. Heat Dissipation: 1.5 kW to 3.5 kW per cabinet/rack for conventional switches.
   d. Control: positive pressure (5 to 10 CFM above exterior corridor) maintained with a minimum of one air change per hour.
4. If a generator power source is available in the building, the HVAC system serving the IDF should be connected to the generator power source. Redundancy is not required but should be considered during design.

iv. Fire Protection
1. Fire protection of the IDF shall be provided as per local building codes. Within terminal buildings and critical structures, pre-action sprinkler systems shall be provided. Outside the terminal area and in non-critical structures (e.g., cargo buildings and parking garages), traditional wet pipe fire sprinkler systems are acceptable when the IDF's are not being used as a main hub for the surrounding area. In addition, any service impact has been identified by the project team and approved by GSP IT to determine that the amount and value of equipment does not require a pre-action system. Locate all sprinkler heads centered over the aisle or wall mounted and never above the cabinets and/or racks. All sprinklers shall be installed with a red-colored, heavy-duty guard.

v. Electrical
1. Cable Runway: Provide a 24” wide cable runway centered above each cabinet and along perimeter walls in a racetrack style layout. Maintain a maximum 12” height above cabinet. Equipment cabinets shall be provided with an integral cable runway on top of cabinets to assist in training of patch cables across top of cabinets. Overhead cable runway is not to be utilized for patch cables.
   a. Wire Basket Tray for Fiber Optic Patch Cords: Provide a wire basket tray attached to the side of the cable runway for routing of fiber optic patch cords and jumpers between racks and cabinets. The wire basket tray shall run continuously between all racks and cabinets. If there is a need to extend fiber optic patch cords to wall mounted equipment the wire basket tray shall extend to above the wall mounted equipment. Wire basket tray shall be sized to support the total quantity of fiber optic strands terminated on Day 1 plus an additional 100% spare capacity. Minimum size of wire basket tray shall be 4” wide by 4” deep.

2. Fire-Rated Pathway: Provide a fire-rated pathway from the corridor raceway to the IDF cable runway. Provide a fire-rated pathway at all IDF wall penetrations where cables need to transition from outside the IDF to the cable runway rack inside the IDF. Provide fire-rated pathways by STI (EZ Path) or Hilti (Firestop Speed Sleeve) sized to support the IDF cable runway capacity and not just the cables to be installed on Day 1. Fire-rated pathways shall also be used for all IDF floor and ceiling penetrations.

3. Grounding: All equipment and raceways will be grounded per ANSI/TIA-607-C. Telecommunication ground bars will be provided in each TR for grounding connections. See Telecomm Grounding System section of this standard.

4. Lighting: 50 foot-candles (fc) at 3’ AFF, average. Lighting fixtures shall be distributed uniformly above the aisles between racks/cabinets and not be located above the racks/cabinets. Lights shall be controlled via occupancy sensor and connected to emergency power.

5. Power: A dedicated, uninterruptable power supply (UPS) shall be provided to support equipment inside the IDF. Where possible, the UPS shall be located inside the IDF Room. UPS shall be fed from emergency generator backed feeders with batteries sized to provide a minimum of 15 minutes of runtime at full load. UPS shall be sized for all equipment inside the IDF plus a minimum of 30% spare capacity depending on future requirements. UPS-backed power panel should be installed inside the IDF to serve equipment within the IDF. When emergency power is unavailable, the battery sizing for runtime at full load shall be at least 4 hours.

6. Equipment Cabinet Power: Each equipment cabinet shall be provided with two 208V, 30A, single-phase twist-lock receptacles mounted above the cabinet. Each receptacle shall be on a dedicated circuit. See Power Distribution (PDU) section of this standard for distribution of power within the IDF cabinets. Final power requirements per cabinet will be confirmed during Design Phase with GSP IT.

7. Open Frame Rack Power: Each open frame rack shall be provided with two 120V, 20A, single-phase, twist-lock receptacles mounted above the rack. Each receptacle shall be on a dedicated circuit. This requirement only applies if open frame rack has active equipment. See Power Distribution (PDU) section of this standard for distribution of power within the IDF racks. Final power requirements per rack will be confirmed during Design Phase with GSP IT.
8. Co-Location Cabinets (if required): if tenant co-location cabinets are required and allowed by GSP IT, provide a single, dedicated 120V, 20A receptacle inside each section of the cabinet. This receptacle shall be connected to emergency power but shall not be supported by the UPS. The tenant is required to provide any UPS requirements within their section of the co-location cabinet.

9. Convenience Outlets: Placed at every aisle and around the perimeter of room for maintenance staff to power test equipment, tools, etc. These receptacles shall be derived off normal building power and not connected to the UPS panel inside the IDF.

vi. Security

1. IDF entry doors shall be equipped with electrified locking device and proximity card reader for control and monitoring by the GSP Access Control System (ACS).

2. CCTV cameras shall be provided for on the entry door into the IDF and viewing equipment cabinets holding GSP LAN equipment. The use of 360° cameras should be investigated to provide coverage of the cabinet/rack aisles.

3. At a minimum, provide a voice wall phone drop location installed at 48” AFF near the entry door.

4. Tenant Rooms/Closets

a. General Requirements

i. On major construction and renovation projects, tenant spaces are typically identified as shell spaces during the design phase of a base building project. In most cases, the detailed design of the tenant space is completed during a tenant fit-out phase closer to the end of the base building design phase or sometimes during the construction phase.

ii. In order to maintain cabling infrastructure and connectivity, GSP requires that tenant equipment be installed in a GSP controlled and maintained IDF Room. Telecommunication, network and system equipment required by a tenant to operate their business systems shall be installed inside a dedicated section(s) of co-location cabinet. Installation of tenant equipment in a tenant-controlled room or space must be approved by GSP IT.

iii. Pathway from the tenant shell space to the nearest GSP IDF Room shall be provided as part of the base building design project.

b. Design Requirements

i. Co-location cabinets shall be provided in all IDF Rooms that are required to support tenant spaces. Co-location cabinets shall be sized to support the number of tenants to be served from the IDF Room. Typically, co-location cabinets are three-section cabinets (14 RMU per section) that are accessed through a separately key-locked door. Instances where a tenant needs more than the space allowed from one section may result in the use of two-section co-location cabinets (28 RMU per section) and will need to be confirmed during the design phase.

ii. Pathway from the tenant shell space to the GSP IDF Room shall consist of an empty conduit (2” min.) or cable tray (12” min.) depending on the anticipated cabling needs of the tenant. This pathway shall be dedicated for use by the tenant’s contractor and shall not be a shared GSP pathway.

iii. The following shall be provided as part of the base building design project:

1. Co-location cabinet(s). Exact quantity to be decided during the design phase.

2. Cable runway above the cabinet to support backbone and horizontal cabling.
3. One 120V, 20A receptacle in each cabinet section. Each receptacle shall be on a dedicated circuit and fed from an emergency power panel. The tenant shall be responsible for the provision of a UPS to support their equipment.

4. Grounding of co-location cabinet to the Telecomm Grounding System.

5. Dedicated, empty pathway from the tenant shell space to the GSP IDF Room.

   iv. The following shall be the responsibility of the tenant:

   1. Horizontal cabling from the co-location cabinet to the work area outlets and field devices.
   2. Terminations including work area outlets, patch panels, punchdown blocks, etc.
   3. Testing and labeling of all cables and terminations.
   4. All cabling and terminations shall adhere to these standards without exception.

5. Outdoor Enclosures

   a. General Requirements

      i. Outdoor Enclosures shall only be deployed in areas to support connectivity to remote areas that do not contain a building structures but require connectivity such as fuel farms, surface parking lots, vehicle gates, etc. The intent of the Outdoor Enclosure is not to replace an IDF, but instead alleviate connectivity issues in areas where an IDF is not financially or architecturally viable.

      ii. The enclosure shall be mounted to a solid structure, pole or pedestal and shall not be mounted to fencing or fence supports. If a structure is not available, a unistrut structure shall be designed to support the enclosure. The structure shall be mounted to a concrete pad.

      iii. Enclosures shall be dedicated to the area or equipment they are serving. For example, enclosures to support vehicle gates to a single gate and shall not serve other gates.

      iv. Enclosures located close to service roads shall be protected with bollards.

   b. Design Requirements

      i. Outdoor Enclosures shall be a NEMA 4X rated stainless steel enclosure with a 3-point locking latch which can accept Medeco padlocks (GSP will furnish padlocks to the contractor for installation). Enclosure shall be sized for the applications and purpose but should never be smaller than 36” wide by 36” high by 12” deep. This size requirement can be reviewed during Design Phase when active and passive requirements which need to be housed in the enclosure are known. There shall also be a metal backboard preinstalled within the enclosure in order to mount equipment. All conduits shall enter from the bottom of the enclosure.

      ii. Outdoor enclosure shall be provided with ground studs to facilitate proper bonding and grounding of the enclosure.

      iii. Outdoor enclosure shall contain seamless, foam-in-place gaskets to prevent contaminants from entering the cabinet.

      iv. Door shall be provided with a tamper switch that will be monitored by the GSP access control system.

      v. Where possible, outdoor Enclosures shall be located in areas that are not accessible to the public.

      vi. Any active equipment placed in an Outdoor Enclosure shall be “hardened” and capable of operating without dedicated cooling and ventilation. All such equipment shall be reviewed with GSP IT during the design phase.

      vii. Provide a label on the door of the enclosure identifying its name and the IDF or MDF Room it is fed from.

      viii. Electrical
1. Where feasible and practical, the outdoor enclosures shall be supported by emergency generator power. If the enclosure is fed from an IDF Room, UPS power shall be extended to the enclosure. If UPS power is not available, a hardened UPS or battery packs shall be provided inside the enclosure to support the required uptime for the equipment inside the enclosure.

2. At minimum, one dedicated 120V, 20A circuit shall be fed from the nearest emergency power panel board in the same IDF Room that provides fiber connectivity to the enclosure.

3. Provide surface mount PDUs to support all equipment in the enclosure. See PDU section of this standard.

6. Room Readiness Checklist
   a. General Requirements
      i. MDF Rooms, IDF Rooms and Outdoor Enclosures require the input of many different stakeholders to make them ready for systems equipment. Requirements in this section outline the steps that must be taken by all those doing work at GSP prior to cabling and equipment installation.
   b. Backbone Cabling Requirements
      i. The following must be completed as part of construction before backbone cabling installation can begin:
         1. Clean and dust free environment.
         2. Physical security is installed and active.
         3. Overhead work inside the MDF and IDF Rooms or within the Outdoor Enclosure must be complete.
         4. Installation of grounding and bonding system
         5. All racks and cabinets have been installed, grounded, leveled and secured to the floor per seismic and manufacturer requirements.
         6. All over-head cable runway has been installed and grounded.
      ii. The following construction activities can take place AFTER the MDF or IDF Room is considered ready for backbone installation:
         1. Commissioning of UPS, HVAC and Fire Suppression systems
         2. Backbone copper installation, termination and testing
         3. Horizontal fiber and copper installation, termination and testing
         4. Any task that does not create dust
   c. Active Equipment Installation
      i. The following must be completed as part of MDF and IDF Room construction before active equipment installation can begin:
         1. Clean and dust-free environment
         2. Physical security is installed.
         3. Lighting fixtures installed and controllable.
         4. Permanent Power and UPS Power installed, active and commissioned.
         5. Permanent HVAC installed and commissioned.
         6. Installation of grounding and bonding system.
         7. Backbone fiber optic cabling installed, terminated, tested and labeled.
      ii. The following construction activities can take place AFTER the MDF and IDF Room is considered ready for active system installation:
1. Horizontal fiber and copper installation, termination and testing. Develop Maintenance Operations Protocol GSP IT review and approval so that access can be granted to complete the work.
Equipment Cabinets and Racks

1. Design Requirements
   a. Enclosed equipment cabinets shall be used to house active equipment, network switches, public address equipment, distributed antenna and radio equipment, horizontal and inter connect cabling, etc.
   b. Open frame rack shall be used to house cabling termination equipment, copper and fiber optic patch panels, splice trays, wire managers, etc. In certain cases, open frame racks may be used to house active system equipment, after review with GSP IT.

2. Enclosed Equipment Cabinets
   a. Equipment cabinets shall be suitable for the support of IT equipment (servers, storage devices, etc.), network equipment, termination apparatus, cable and cord management apparatus, common communications equipment, and other similar equipment.
   b. Cabinets shall be 80” high, 42” deep (40” usable depth), and 30” wide with standard 19” rack rails providing a minimum of 42 rack mounting units (RMU).
   c. Mounting rail holes spacing shall meet standard EIA-310-D. Mounting rails shall be tapped with pass thru holes and cable lacing slots, punched on EIA (0.625” x 0.625” x 0.5”) standard spacing. Cabinets shall be supplied with #12-24 screws for tapped rails.
   d. Equipment mounting rails shall consist of two pairs of equipment mounting rails that can be adjusted front-to-rear. Depth marks shall be provided on top and bottom of frame for easy alignment of the rails when adjusting depth. Permanently stamped rack unit (RU) markings shall be on the front and rear flanges.
   e. The cabinet shall include a single front door with a high air flow perforated metal panel, hidden tamper-resistant hinges with quick-release hinge pins and a swing handle. The door shall be removable and reversible to open from the right or left. The rear door shall include a high flow perforated metal double-keyed lock rear door shall be a split perforated door with a keyed lock swing handle. The doors shall be removable. Front door shall be locked with a battery powered keyless cabinet lock with an integral card reader capable of reading GSP security cards.
   f. Mounting rails, top panel, side panels and doors are electrically bonded to the cabinet frame and a ground terminal block is included to attach the frame to ground.
   g. The cabinet shall include two locking solid side panels with spring loaded latches for easy installation and removal. The cabinet shall be designed to allow baying with or without side panels installed.
   h. The cabinet shall include one pair of PDU mounting brackets. The brackets shall attach to the rear right or left corner of the cabinet frame and shall include tool-less mounting points for two vertical power distribution units (PDUs).
   i. Cabinets shall contain vertical cable managers installed on both sides at the front of the cabinet. Vertical managers shall be 5.5” wide with plastic fingers for routing of cables to/from equipment.
   j. All cabinets shall be floor mounted and permanently fixed to the floor with bolt-down kits. Multiple cabinets shall be connected together with side panels removed for routing of cables between cabinets, provide ganging kits as required. Side panels shall remain when cabinet is located next to a co-location cabinet or other shared use cabinet.
k. The cabinet frame shall support minimum 3,000 lb. static load rating when supported on leveling feet and secured to the structural floor. Cabinet shall be Seismic Zone 4 rated and UL Listed. Cabinet finish shall be powder coated black.

l. Provide a 19” grounding buss bar that accepts two-hole grounding lugs ground conductors in the top of each equipment cabinet on the back side of the rails.

m. Approved Manufacturer: Ortronics Model #OR-GXC422942-A1-B

3. Open Frame Racks

a. Open frame racks shall be suitable for the support of termination apparatus, cable and cord management apparatus, network equipment, and other similar equipment, within a MDF or IDF Room.

b. Racks shall be 84” high and 15” deep with standard 19” rack rails providing a minimum of 45 rack mounting units (RMU). Mounting holes shall be standard EIA/ECA-310-E, Standard #12-24 tapped rails.

c. Rack uprights shall consist of a 3” channel and shall be marked with rack mount unit (RMU) markings on the front and back of both uprights.

d. All racks shall be floor mounted and permanently fixed to the floor with bolt-down kits. Multiple racks shall be connected together.

e. Racks shall comply with EIA-310-D and shall have a minimum static load rating of 1,200 lb. Rack finish shall be powder coated black and UL Listed.

f. Approved Manufacturer: Ortronics Model #OR-1984-T2SDB

4. Wire Management

a. All racks and cabinets shall have horizontal cable management provided between electronic and patch panel components, minimum size of horizontal manager shall be 3.5” high (2 RMU). The use of 1.75” high (1 RMU) wire managers may only be used if approved by GSP IT. Horizontal wire managers shall be constructed with a removable top cover and a series of fingers on either side, as well as pass-through holes at the back for routing of cables.

b. Vertical cable management shall be used on both sides of racks and between racks in a single row. Vertical managers shall be double-sided and run the entire height of the rack and be 6” wide, minimum, with a metal cover door.

5. Power Distribution Units (PDU)

a. PDUs shall be provided in all cabinets and specific racks to provide power to rack mounted equipment. All PDUs shall be rack mounted, metered, non-surge protected units provided with twist-lock input plugs and remote access power monitoring via secure web browser, SNMP or SSH. Coordinate exact voltage and output requirements with GSP IT during the design phase. The following PDU specifications provide a 120V, single-phase output and shall be considered minimum requirements. Dependent on the exact size and configuration of network and servers required for the specific project and application, there may be a need for 208V power at the cabinets. Coordinate exact equipment power and voltage requirements with GSP IT prior to specification of PDUs.

i. 2.9 KW, Single-Phase, Monitored, L5-30P with 120V (24) NEMA 5-20R receptacles.
Pathways Design Standards

1. Design Requirements
   a. All cabling shall be installed in conduit, cable tray/runway or supported by j-hooks.
   b. Conduit shall be used for any cabling that is exposed and not above a concealed ceiling.
   c. Use Category 6 rated j-hooks and wire mesh cable tray (basket tray) to support plenum-rated cabling is permissible if proper design precautions are followed.
   d. Pathway design and applications shall be reviewed with GSP IT during the design phase.

2. Conduits
   a. Design Requirements
      i. Conduits shall be used for any cabling that is exposed, located above a concealed, inaccessible ceiling or underground.
      ii. Conduits and boxes shall be color coded to identify the system they are supporting. System colors are as follows:
         1. Data/Telecom - Blue
         2. Security (ACS/CCTV) – Yellow
         3. Fire Alarm - Red
         4. EM/Life Safety - Green
         5. 120/277V non-emergency - no color
   b. Application
      i. Outdoors
         a. Exposed Above Grade Conduit: Galvanized Rigid Conduit (GRC).
         b. Concealed Conduit, Above Ground: GRC
         c. Underground Conduit: Rigid Non-metallic (RNC), Type EPC-40-PVC
      ii. Indoors
         a. Exposed, Not Subject to Physical Damage: Electrical Metallic Conduit (EMT)
         b. Exposed, Subject to Physical Damage: GRC
         c. Concealed in Ceilings and Interior Walls and Partitions: EMT
         d. Damp or Wet Locations: Intermediate Metal Conduit (IMC)
         g. Optical-fiber-cable pathway not required for armored optical fiber.

3. Fire Rated Pathways and Sleeves
   a. Fire rated pathways shall be used in place of putty style fire stopping whenever possible.
   b. Pathways shall be gangable allowing both horizontal and vertical stacking of pathways.
   c. Fire rated pathway shall be used for all ceiling and floor penetrations. The use of small diameter conduit sleeves shall be limited and only used for one-off conditions.

4. Cable Runways
   a. Cable runways shall be constructed of rectangular steel tubing and used for the distribution of low voltage cables within MDF and IDF Rooms. Runways are not to be confused with cable trays that are only to be used outside MDF and IDF Rooms.
   b. Cable runways shall only be allowed for use inside MDF and IDF Rooms and shall be installed above cabinets and racks as well as around the perimeter of the room.
c. Runways shall be capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
d. Runways for use inside MDF and IDF Rooms shall be 24” wide (min.).
e. Runways shall be manufactured from 3/8” (9.5mm) wide by 1.5” (38mm) high tubular steel with 1.65 mm (.065”) wall thickness. Cross members will be welded in between stringers on 12” (300mm) intervals/centers.
f. Runways shall be epoxy-polyester hybrid powder coat (paint) in black, unless noted otherwise.
g. Provide wall mount or ceiling trapeze supports. The use of a single center hung support rod shall not be allowed.
h. Grounding kits are required to provide a method of bonding runway sections and turns together that is independent of splices. The grounding kit shall be constructed of UL listed components. The preferred solution is a #6 AWG green insulated stranded copper conductor connected on both ends to ladder rack using two-hole compression lugs and stainless-steel hardware.
i. All accessories shall be manufactured from same material as runway section. Provide following accessories:
   i. Cable straps used for attaching cable bundles to the runway cross members must be reusable with a hook and loop-style closure.
   ii. End caps used to cover the ends of runway shall be manufactured from a black fire-retardant rubberized material.
   iii. End closing kits used to cover the end of runway. Kits shall consist of a bar cut to match the width of the runway and the hardware required to attach the bar to the end of a length of runway.
   iv. Radius drops used to create a radius to form cables over as the cables exit or enter the runway. The extrusion will be formed in a 90° arc with a minimum bend radius of 75 mm (3”). Radius drops will attach to either the side stringer or the cross member of the runway. Provide radius drops at all sections where cable exits runway.
v. Runway shall also include 6” standoff attached to the sides of the rail on each side separated at 2’ intervals.

5. Wire Basket Tray
   a. Wire basket tray shall be constructed of welded steel and shall be used for the routing of fiber optic patch cords and jumpers within MPOE, MDF and IDF Rooms. Only fiber optic patch cords shall be placed inside the wire basket tray.
   b. Wire basket tray shall be secured to the side of the cable runway inside the room and shall run continuously between all racks and cabinets inside the room. The basket tray shall be extended to all wall mounted equipment that requires a fiber optic patch cord or jumper.
   c. Wire basket tray shall be sized to support the total number of fiber optic strands terminated on Day 1 plus an additional 100% spare capacity. The minimum size of a wore basket tray will be 4” wide by 4” deep.
   d. Material construction and installation requirements for wire basket tray shall meet the same requirements as specified in “6. Cable Trays” section.

6. Cable Trays
a. Cable trays shall be constructed of welded steel wire and used for the distribution of low voltage cables between MDF and IDF Rooms and to field devices. Cable trays are not to be confused with cable runways that are only to be used inside MDF and IDF Rooms.

b. Cable trays shall be allowed to support cables installed above accessible ceilings. Cable trays shall not be installed where they are visible by the public or in areas without ceilings where cables could be damaged (i.e., mechanical, electrical, storage rooms).

c. The use and routing of cable trays shall be reviewed with GSP IT during the design phase.

d. Plenum rated cabling shall be used in locations where basket tray is allowed.

e. Cable tray may not exceed a 40% fill.

f. Category 6 cabling for CCTV cameras may be placed in basket tray and must utilize its own dedicated conduit to the camera.

g. Cable tray shall be separately supported by building structure. Provide detailed design of cable tray supports and seismic-restraints.

h. Cable trays shall consist of wires formed into a standard 2” by 4” (50 mm by 100 mm) wire mesh pattern with intersecting wires welded together. Mesh sections must have at least one bottom longitudinal wire along entire length of section.

i. Straight sections shall be fabricated from continuous, rigid, welded steel wire mesh, to allow continuous ventilation of cables and maximum dissipation of heat, with UL Classified splices where tray acts as equipment grounding conductor.

j. Cable tray shall be capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.

k. Provide wall mount or ceiling trapeze cable tray support. The use of a single center hung support rod shall not be allowed.


7. J-Hooks

a. J-hooks shall be allowed to support cables installed above accessible ceilings. J-hooks shall not be installed where they are visible by the public or in areas without ceilings where cables could be damaged (i.e., mechanical, electrical, storage rooms).

b. Plenum rated low-voltage cabling shall be used in locations where J-Hooks are allowed.

c. J-Hooks for telecommunications pathways shall be spaced at 48” or less interval to limit cable degradation. Directional or level changes require closer spacing. Individual Cable Manufacturers recommendations must also be followed as they may have a smaller installation interval in order to comply with an extended warranty.

d. Horizontal cabling sag in a J-Hook pathway shall be limited to a maximum of 12”

e. Do not install cables loose above lock-in type ceiling tiles, drywall or plaster ceilings.

f. Load hangers to no more than 40% fill. Provide hangers side by side on a common bracket where required by cable quantities.

g. Cables shall be installed at least 6” above the ceiling tiles and shall not touch the ceiling.

h. Do not support j-hook from ceiling system tie wires or grid in fire rated systems.

i. J-hooks shall be Category 6 rated. The use of bridle rings is prohibited.
Backbone Cabling Infrastructure

1. Fiber Optic Backbone Cable
   a. Design Requirements
      i. Backbone cabling is the portion of the telecommunications cabling system that provides the interconnections between the MDF and IDF Rooms. Backbone cabling consists of backbone cables, main and intermediate cross-connects, and patch cords.
      ii. The backbone cabling shall be installed in a hierarchical star topology with no more than two levels of cross-connects.
      iii. All fiber optic terminations shall be fusion spliced to factory assembled pigtailed cassettes terminated with LC connectors as specified in this standard.
      iv. All installed fiber optic cable strands shall be terminated and tested. In no case shall strands be left unterminated or left for another project to terminate.
      v. All optical fiber terminations, whether factory or field terminated, shall be made with LC type connectors unless the specific application requires alternate connectors which have been approved by GSP IT.
      vi. All fiber connectors, whether patch cord or premise, will be constructed of ceramic (zirconia).
      vii. Optical fiber patch cord shall be single mode, two-strand, duplex configured, non-plenum rated, tight buffered in composition, with a maximum length of 5 m (16’). Fiber patch cords shall have a yellow jacket and come with a removable/reusable LC duplex clip.
   b. Cable Requirements
      i. Single-mode cabling will be used for backbone connectivity.
      ii. The use of multimode fiber optic cable is not allowed and shall only be used under approval by GSP IT.
      iii. Inter-building Backbone Fiber Optic cabling between MDF to MDF shall be indoor/outdoor rated and at a minimum 48-strand single-mode home run.
      iv. Intra-building Backbone Fiber Optic Cabling shall be plenum rated 36-strand (minimum) single-mode home run from the MDF to each IDF in the building.
      v. The fiber optic cable construction shall consist of 8.3 µm single-mode optical fibers, typically formed into groups of 6 or 12 fibers each. These groups and individual fibers shall exceed all requirements for ANSI/TIA-568-B.3 and support high-speed communication network applications. These groups are assembled to form a single compact core, which is covered by a protective sheath. The sheath consists of an overall jacket and shall contain one or more layers of dielectric material applied over the core.
      vi. All single-mode fiber shall support 10 Gigabit Ethernet 10 Gbps to distances of up to 10,000 m @ 1310 nm and 40,000 m @ 1550 nm per IEEE 802.3 performance. The single-mode fiber utilized in the optical fiber cable shall meet TIA-492CAAB, “Detail Specification for Class Iva Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak,” and ITU recommendation G.652.C “Characteristics of a single-mode optical fiber cable.”
      vii. Single mode fibers must comply with ANSI/TIA-492, ANSI/ICEA S-83-596, and ANSI/ICEA S-83-640. Fiber must comply with ANSI/TIA-455 and IEC 793 test methods for required attributes. Fibers shall have dual wavelength capability; transmitting at 1310 and 1550 nm ranges. The coating shall be mechanically strippable.
viii. The maximum installation tension shall be 600 lb. maximum (short term). The maximum operating tension shall be 200 lb. (long term).
ix. The minimum installation bend radius shall be a minimum of 15 times the cable outer diameter, and the minimum operating bend radius shall be a minimum of 10 times the cable outer diameter.
x. All Optical Fiber cables shall be shipped with OTDR results for each fiber. OTDR test results shall show attenuation and bandwidth.
c. Applications
i. Outdoor
1. Provide cable suitable for installation in outdoor, underground environments with loose tube, fully water blocked gel-free waterproof cables.
2. Cable jacket shall be polyethylene suitable for underground installation and imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).
3. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
4. Outside plant cable shall not be used for interior applications.
ii. Indoor
1. Provide UL-listed Communications Cable Type CMP for plenum applications where cable is run exposed on j-hooks or in cable tray located in ceiling cavities.
2. Provide Type CMR for riser applications where cable is run inside conduit. Outside plant cable shall be used for all applications where cable is to be run in underground conduits.
3. Indoor plant cable shall not be used for exterior applications.
d. Innerduct
i. Optical fiber cabling placed in cable tray and/or conduits larger than 3” shall be placed in fabric innerduct.
ii. Fabric innerduct for indoor applications shall comply with UL 2024; flexible-type pathway with a circular cross section, approved for plenum installation unless otherwise indicated.
iii. Fabric innerduct shall be manufactured from white polyester and nylon resin polymer.
iv. Standard Outdoor Fabric Innerduct shall consist of 3-inch multi-cell polyester/nylon textile innerduct containing 1250lb polyester flat woven pull tape and a sewn-in 18AWG solid copper wire suitable for direct wired toning equipment and above ground handheld locators.
v. Provide all required conduit plugs, termination bags and duct water seals for installation of fabric innerduct in underground environments.
vi. For installation in conduits dedicated to backbone cabling, provide the maximum number of fabric innerducts for the size of conduit planned. For example, for a 4” conduit, provide two (2) 3-inch, 3-cell fabric innerducts.
e. Termination Equipment
i. Connectors
1. All outlets, jacks, and connectors shall exceed all requirements of ANSI/TIA-568-B.3.
2. Fiber optic cable connectors shall be capable of terminating optical fiber glass cables with outside diameters ranging from 125 – 900 microns. Fabricate connectors with optical fiber, self-centering, axial alignment mechanisms. LC-type connectors shall have an insertion loss no greater than 0.3 dB.
3. Coordinate with GSP IT to provide the correct fiber optic connector style/type for both the patch panels and patch cords.
ii. Fiber Distribution Unit

1. Patch Panel Housing
   a. Fiber Optic housings shall provide a means for securing, strain-relieving, protecting, and labeling of fiber optic cable terminations.
   b. Housings shall be designed for rack-mounted applications that support conventional cross-connection and interconnection schemes as well as splicing applications in the same housing.
   c. Rack mountable housings shall accept an interchangeable pigtailed splice cassette (specified below).
   d. The housing shall contain a front compartment whose function is to protect and manage jumpers that interface with the main housing behind it. The front jumper assembly compartment shall be removable and be accessible via a translucent door.
   e. The front compartment shall contain jumper egress openings on both sides that are edged with protective pass-through grommets that provide bend radius support for optical fiber jumpers.
   f. The rear assembly housing shall be accessible via a hinged door. The door shall contain a routing and cable sub-unit slack storage bracket for interior management of cable sub-units and buffer tubes.
   g. Blank adapter panels shall be provided to fill unused space within housings. Housings shall be supplied with blank adapter panels for all available positions. The blank panel shall be attached with at least two spring clips to allow quick installation and removal.
   h. Some applications may require the use of a wall mounted patch panel (e.g. outdoor enclosures). Provide wall mount patch panel with port capacities as required. Wall mount unit shall contain cable routing and strain relief supports for support of cable during and after installation and allow for top and bottom cable entry, via conduits. Patch panel shall be provided with loaded plates containing required quantity of adapters and be provided with locking hinged door.

2. Fiber Optic Pigtailed Splice Cassette
   a. Pigtailed splice cassettes enable faster field splicing and easy modular management of connectors within the patch panel housing. Pigtails are pre-loaded and pre-routed for quick fusion splicing of either individual or ribbon fiber pigtails.
   b. The splice cassette shall be provided with pre-installed connector pigtails and panels.
   c. The splice cassette shall be able to hold and contain up to one meter of 2.0-3.0 mm buffer tube slack or jacketed pigtail slack (up to 24 fiber) on the exterior bottom of the base.
   d. The splice cassette shall contain a pivoting (and removable) splice tray above the base in a horizontal position that rotates up into a vertical position at least 90 degrees relative to the base allowing access to the base.
   e. The splice tray shall contain one interchangeable splice organizer capable of holding up to (24) splice heat-shrinks, routing tabs and provisions for holding a total of two meters of 900-micron fiber slack and contain slots and provisions for installing cable ties for securing incoming and outgoing buffer tubes and/or jacketed optical fibers.
   f. The pigtailed splice cassette shall contain relief slots for holding up to two buffer tube transition ("fan-out") kits on either side of the base.
i. Splicing of backbone fiber optic cable is prohibited. However, there are instances where this may be required due to overall cable length or connection/extension of existing fiber cabling. If splices are required they must be coordinated and approved with GSP IT.

ii. Make no splices except at indicated splice points, or specifically approved by GSP IT. Splices shall be fusion type and shall be located within closures, distribution centers, or splice trays rated for the location.

iii. All fusion splices must have a bi-directional average of $\leq 0.1$ dB at all wavelengths tested.

iv. A 40mm fusion splice protection sleeve must be used. This will protect each splice and the sleeve must meet Telcordia GR-1380-CORE.

g. Patch Cords

i. Each terminated fiber optic cable shall be provided with a fiber optic patch cord at both ends.

ii. Single-mode, duplex fiber patch cable shall be LC-LC, 2.0 mm, yellow jacket.

iii. The single-mode, duplex fiber patch cable shall consist of a 9-micron core and a 125-micron cladding. The fiber cladding shall be covered by aramid yarn and OFNR rated.

iv. Length of patch cords shall be specified for each project. Minimum length of patch cord is 3 meters. Coordinate exact length and color of each patch cord with GSP IT during the design phase.

h. Testing

i. General

1. All fiber optic cable shall be bi-directionally tested using an optical loss test set (OTS), as well as an optical time domain reflectometer (OTDR). Testing shall be performed in accordance with ANSI/TIA-568-B and with testing equipment manufacturer recommendations.

2. Test equipment used shall have been certified calibrated by the manufacturer or an independent test and calibration firm, to the manufacturer’s specifications. Meter calibration shall be performed within 1 year of the testing date.

3. Reports shall show circuit ID, cursor marks, total attenuation, date of installation and test used.

ii. Reel Testing

1. For cable runs > 3,000’, provide Optical Time Domain Reflectometer (OTDR) testing on each optical fiber of the cables that are to be installed. This testing should follow the same general procedures described in the installed OTDR testing section with the following exceptions:

   a. This testing need only be done in one direction and at 1550 nm for SM fiber and 1300 nm for MM fiber unless an anomaly is detected. If an anomaly is detected on a fiber during a unidirectional reel test, the contractor should test it in both directions (if possible) and at both 1310 and 1550 nm for SM and 850 and 1300 nm for MM.

iii. Optical Loss Test Set (OLTS) Testing

1. Using an OLTS, measure each installed fiber link from patch panel to patch panel or patch panel to outlet and report optical loss in decibels (dB). Single mode fibers shall be tested bi-directionally at 1310 and 1550 nm. Losses shall be less than or equal to the maximum attenuation values listed in ANSI/TIA-568-C.3. Links found to have greater than acceptable values must be tested using an OTDR, with problems corrected and retesting to demonstrate compliance.
2. Testing shall consist of the permanent link only (patch panel – patch panel, no patch cords).
3. Test or reference cords shall have an insertion loss ≤ .20dB and return loss ≥ 55dB. Reference cords shall be no shorter than 2 m but less than 5 m.
4. For warranty and certification, the “one jumper” reference method shall be used and verified that the tail jumper is within specification. For every cable tested the reference must be reset and the test results must be saved.

iv. Optical Time Domain Reflectometer (OTDR) Testing
1. Using an OTDR, bi-directionally test every fiber link between the MDF and IDF. Also, bi-directionally test each fiber link that fails the OLTS attenuation test, is greater than 2000 m in length, or contains splices. Test links for overall length, faulty connectors, splices, terminations, and the integrity of the cable and its component parts. Single-mode fibers shall be tested at 1310 or 1550 nm. Mated connector pairs with losses in excess of 0.75 dB and splices with losses in excess of 0.3 dB shall be replaced.
2. Testing shall consist of the permanent link only (patch panel – patch panel, no patch cords).
3. Test or reference cords shall have an insertion loss ≤ .20dB and return loss ≥ 55dB. Reference cords shall be no shorter than 2 m but less than 5 m.
4. All OTDR testing must have a 150 m or longer launch and receive cable with reference connectors with an insertion loss ≤ .20dB and return loss ≥ 55dB. The use of a “loop” cord at the far test end to test multiple fibers at one time is allowed. The loop cord must have the same parameters as the launch and receive cable.
5. Each link must be bi-directionally tested @ 1310 and 1550 nm for single mode.

v. Acceptable Attenuation Values
1. The general attenuation equation for any link segment is as follows:
   a. Link Attenuation = Cable Attenuation + Connection Attenuation + Splice Attenuation
2. Single-Mode Attenuation Coefficients
   a. Cable Attenuation = Cable Length (km) x (1.0 dB/km@1310nm or 1.0 dB/km@1550nm).
   b. Connection Attenuation (LC connectors) = 0.5 dB per connector pair.
   c. Fusion Splice Attenuation = Splices x 0.2 dB.

vi. Documentation
1. Test reports shall be submitted in hardcopy and electronic format. Hand-written test reports are not acceptable.
2. Hardcopy reports are to be submitted in labeled three-ring binders with an attached affidavit verifying passing execution of all tests. Hardcopy summary reports shall contain the following information on each row of the report: circuit ID, test specification used, length, date of test, and pass/fail result.
3. Electronic reports are to be submitted on USB format. If proprietary software is used, USB shall contain any necessary software required to view test results. If the results are delivered in a standard format like Excel, Access, CSV, .pdf files, etc. then software to read these files is not required to be provided. Electronic reports must be accompanied by a Certificate signed by an authorized representative of the contractor warranting the truth and accuracy of the electronic report.
4. Cable identification tags/numbers on cable test reports shall meet the cable identification/tag on the faceplate, patch panel, etc. label.

vii. Warranty
1. The contractor shall certify and provide verification from the relevant manufacturer for every fiber-optic cable link installed in the project at project completion. If required, the Contractor shall engage third party to certify testing and commissioning of end-to-end installation.
2. GSP IT requires that all installed cables and hardware are accompanied with a minimum 25-year manufacturer warranty. This includes all fiber optic cable, terminations (splicing), and hardware. It is the contractor’s responsibility to ensure that all warranty requirements are met and submitted according to manufacturer procedures, including all test reports, as-built drawings, bills of material, etc.

2. Copper Backbone Cabling
   a. Design Requirements
      i. Backbone copper cabling is the portion of the telecommunications cabling system that provides the interconnections between the MDF and IDF Rooms. Backbone cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.
      ii. The backbone copper cabling shall be installed in a hierarchical star topology with no more than two levels of cross-connects.
      iii. The backbone copper cabling will be used to support the connectivity for analog applications and systems including courtesy phones, tenant dry copper circuit needs, and other GSP dry copper circuit needs.
      iv. Backbone copper cabling shall consist of a minimum 100-pair, Category 3 rated unshielded twisted pair cable. Backbone pair counts shall be confirmed by GSP IT during the Design Phase.
      v. Backbone copper cabling shall comply with ICEA S-90-661-2012, NEMA WC 63.1, and TIA-568-A for Category 3 cables and shall be certified to meet transmission characteristics of Category 3 cable at frequencies up to 16 MHz.
      vi. Backbone copper cables shall be riser (CMR) or plenum rated (CMP) per the installation environment. Select an appropriate cable construction, including external jacket properties, when installing cables in aerial, outdoor, underground and corrosive environments.
      vii. All installed cable pairs shall be terminated and tested. In no case shall pairs be left unterminated or left for another project to terminate.
      viii. Copper backbone cabling shall be terminated on rack mounted 110 blocks within the MDF and IDF Rooms. Copper cross-connections are to be permanently punched down.
   b. Cable Requirements
      i. The backbone copper cable shall support the following applications:
         1. Analog and Digital Voice
         2. ISDN
         3. DSL
         4. T1
      ii. Cable assembly shall consist of 25 pairs and two fillers cabled together with overall nylon binders.
      iii. Jacket shall consist of no lead flame retardant thermoplastic with a ripcord for easy jacket removal.
iv. Individual pair colors shall adhere to industry standards.
v. Pulling tension shall be 600 lb./1000’, minimum.
vi. Operating temperature shall be 60 °C (140 °F), maximum.

c. Applications
   i. Outdoor
      1. Outdoor rated backbone copper cable (where applicable) shall meet all performance requirements as specified for indoor/interior backbone copper cable. In addition, the inner construction of the cable shall be surrounded by a filling compound to prevent water ingress. The outer core shall be a sunlight and abrasion resistant black polyethylene outer jacket.
      2. Indoor plant cable shall not be used for exterior applications.
   ii. Indoor
      1. Provide UL-listed Communications Cable Type CMP for plenum applications where cable is run exposed on j-hooks or in cable tray located in ceiling cavities.
      2. Provide Type CMR for riser applications where cable is run inside conduit. Outside plant cable shall be used for all applications where cable is to be run in underground conduits.
      3. Indoor plant cable shall not be used for exterior applications.

d. Termination Equipment
   i. Punchdown Blocks
      1. Punchdown blocks for riser terminations and horizontal analog circuits shall be rack mountable standard Category 6, 110-type connecting blocks providing terminations for 22-26 AWG solid cable. Each panel shall be provided with designation strips or labels for labeling each circuit.
      2. The termination block shall meet or exceed the performance criteria per ANSI/TIA-568-C.2.
      3. Backbone cabling blocks shall use 5-pair connecting blocks on each 25-pair row.
      4. Punchdown blocks shall be installed in the cabling rack. The use of wall mounted punchdown blocks shall be avoided where possible and only used if approved by GSP IT.
   ii. Cross-connects
      1. The cross-connect kits shall include all the components required to complete a wall-mounted 110 cross-connect installation and be available in 100-pair configuration.

e. Separation of Copper cables from EMI Sources
   i. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
   ii. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
      1. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
      2. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
      3. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).
   iii. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
      1. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
      2. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
      3. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).
iv. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
   2. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).

v. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).

vi. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

f. Testing
i. General
   1. All cables shall be tested in accordance with ANSI/TIA standards, the Manufacturer’s Certification Program and best industry practice. The field test equipment shall meet the requirements of ANSI/TIA-568-C including applicable TSB’s and amendments.
   2. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance.
   3. Horizontal cabling shall be tested using a Level III test unit for Category performance compliance.

ii. Category 3 Channel Testing
   1. The basic tests required are:
      a. Wire Map
      b. Length
      c. Attenuation
      d. NEXT (Near end crosstalk)
      e. ACR (Attenuation to crosstalk ratio)
      f. Return Loss
      g. ELFEXT Loss
      h. Propagation Delay
      i. Delay skew
      j. PSNEXT (Power sum near-end crosstalk loss)
      k. PSACR (Power sum attenuation to crosstalk ratio)
      l. PSELFEXT (Power sum equal level far-end crosstalk loss)

iii. Documentation
   1. Test reports shall be submitted in hardcopy and electronic format. Hand-written test reports are not acceptable.
   2. Hardcopy reports are to be submitted in labeled three-ring binders with an attached affidavit verifying passing execution of all tests. Hardcopy summary reports shall contain the following information on each row of the report: circuit ID, test specification used, length, date of test, and pass/fail result.
   3. Electronic reports are to be submitted on USB format. If proprietary software is used, USB shall contain any necessary software required to view test results. If the results are delivered in a standard format like Excel, Access, CSV, .pdf files, etc. then software to read these files is not required to be provided. Electronic reports must be accompanied by a
Certificate signed by an authorized representative of the contractor warranting the truth and accuracy of the electronic report.

4. Cable identification tags/numbers on cable test reports shall meet the cable identification/tag on the faceplate, patch panel, etc. label.

g. Labeling
   1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
   2. See Appendix B – Labeling Requirements for more information.

h. Warranty
   1. The contractor shall certify and provide verification from the relevant manufacturer for every backbone cable link installed in the project at project completion. If required, the Contractor shall engage third party to certify testing and commissioning of end-to-end installation.
   2. GSP IT requires that all installed cables and hardware are accompanied with a minimum 25-year manufacturer warranty. This includes all backbone cable, terminations and hardware. It is the contractor’s responsibility to ensure that all warranty requirements are met and submitted according to manufacturer procedures, including all test reports, as-built drawings, bills of material, etc.
Horizontal Cabling Infrastructure

1. Design Requirements
   a. This standard specifies a telecommunications cabling system that will support a multiproduct multi-vendor environment. The standard is designed to provide for installation of a structured cabling system that will accommodate current and future voice and data specifications.
   b. GSP uses a voice over Internet protocol (VoIP) telephone system. In this document the term data cabling (and similar derivative terms) refers to cables used for both voice and data applications.
   c. No tenant may run any horizontal or backbone cabling infrastructure outside of their leased space, except within GSP approved conduits between the IDF Room and the tenant lease space.
   d. Horizontal Cabling is the portion of the telecommunications cabling system that extends from the work area to the horizontal termination panel in the IDF Room. The horizontal cabling includes horizontal cables, telecommunication outlets at workstations, patch panels, patch cords or jumpers and consolidation points.
   e. The maximum distance of horizontal cabling shall be 90 m (295’), independent of media type. The length of the cross-connect jumpers or patch cords attached to the horizontal cabling should not exceed 5 m (16’). For each horizontal cable run, the total length of patch cords at the workstation and in the IDF shall not exceed 10 m (33’).
   f. Designers working at GSP must design all devices to a 250’ length. Any devices in excess of 250’ must be approved by GSP IT.
   g. To ensure conduit fills are not excessive and to aid in efficient installation practices, the total fill capacity of a conduit shall not exceed 40%.
   h. Horizontal Cabling system shall use matched components from a single manufacturer, and the cabling system shall be certified to deliver system performance over the lifetime of the applications for which the cabling system was originally designed to support.
   i. All components used in the UTP-based cabling system shall be warranted for a period of 25 years from date of installation against defects in materials and/or workmanship.
   j. All Horizontal Cabling shall be terminated to the ANSI/TIA-568B specification.

2. Cable Requirements
   a. Horizontal cabling shall be four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 350MHz. Category 6 cable shall conform to TIA/EIA 568B Commercial Building Telecommunications Cabling Standard, Horizontal Cable Section and support the following high-speed communication network applications:
      i. 10BASE-T through 1GBASE-T Ethernet
      ii. Power over Ethernet (PoE & PoE+)
      iii. 155Mb/s ATM and Token Ring
      iv. 550MHz Broadband Video
      v. Backward compatible to legacy protocols and applications
   b. Cables shall be marked as UL verified with a minimum of a Category 6 (or latest approved standard) rating.
   c. All cable shall utilize the appropriate sheath for the particular application. Any cable placed in space used as an air return or in any way connected with air handling plenums or building
ventilation shall be low-smoke, fire-retarding cable, and must comply with the National Electrical Code Articles 725, 760, and 800.

d. Conductor shall be 23 AWG (minimum) solid, bare, annealed copper in a core of four balanced twisted pairs held in place by a full cross-web separator.

e. Outdoor Rated Category 6 Cable (where applicable) shall meet all performance requirements as specified for indoor/interior Category 6 cable. In addition, the inner construction of the cable shall be surrounded by a filling compound to prevent water ingress. The outer core shall be a sunlight and abrasion resistant black polyethylene outer jacket.

f. Category 6 cable jacket shall be blue in color.

g. Applications

i. Outdoor

1. Provide cable suitable for installation in outdoor, underground environments with loose tube, fully water blocked gel-free waterproof cables.

2. Cable jacket shall be polyethylene suitable for underground installation and imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

3. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.

4. Outside plant cable shall not be used for interior applications.

ii. Indoor

1. Provide UL-listed Communications Cable Type CMP for plenum applications where cable is run exposed on j-hooks or in cable tray located in ceiling cavities.

2. Provide Type CMR for riser applications where cable is run inside conduit. Outside plant cable shall be used for all applications where cable is to be run in underground conduits.

3. Indoor plant cable shall not be used for exterior applications.

iii. Shielded/Screened Cable

1. The use of shielded or screened Category 6 cable shall only be used when the system, device or application requires this type of cable for operation. Shielded and screened cables shall be terminated on dedicated patch panels with suitable grounding terminations and modular connectors designed for use with shielded cables. Shielded cables shall not be terminated on standard, unshielded patch panels or modular connectors. The use of shielded or screened cabling shall be approved by GSP IT prior to specification.

3. Termination Equipment

a. Work Area Outlets

i. Modular Connectors:

1. The connector module shall meet or exceed the Category 6 performance criteria per TIA/EIA 568B Commercial Building Telecommunications Cabling Standard requirements.

2. All modules shall utilize “RJ-45 style” 8-position, 8-conductor data jacks. All jacks shall be terminated to the 568B wiring scheme.

3. The connector shall snap into an industry standard keystone type opening.

4. The connector module shall be designed for use at the work area outlet (WAO), MDF and IDF Room without modification.

5. The connector module shall be available in both the T568A and T568B wiring configurations within the same module.
6. The connector module shall have an insulation displacement connection featuring insulation splicing of 22 to 24 AWG plastic-insulated solid copper conductors forming a gas-tight connection.

7. Modules shall have replaceable/reusable icons denoting data and voice connections at a minimum.

ii. Faceplates and Outlet Housings
   1. Faceplate and outlet housing connector openings shall be the industry standard keystone type.
   2. Faceplate shall be available in 4-, 6- and 8-port configurations.
   3. Faceplates shall be available in single- and double-gang format.
   4. Faceplates for wall-mounted phones shall be one port single gang faceplates that have wall-mount lugs allowing vertical phone mounting.
   5. Flush mount faceplates and boxes shall be provided at all locations unless otherwise noted. Exceptions to the specifications which request surface mounting in lieu of flush must be submitted and obtain approval from GSP IT prior to installation.
   6. Faceplates for flush floor mounted outlets shall be coordinated with the floor box or poke thru device that will be selected and installed for the project.
   7. System furniture faceplates shall be capable of fitting in the furniture system selected for the project.
   8. Furniture faceplate extenders shall be used (if required) to maintain proper bend radii within the furniture raceway/pathway.
   9. Faceplates shall provide a labeling location using built-in labeling windows for both the individual outlet port and the entire outlet housing location.
   10. The faceplates shall provide for connector modularity and flexibility in configuring multimedia outlets that respond to various network media needs such as audio, video, coaxial and optical fiber applications.
   11. Faceplate colors shall be coordinated with GSP IT for each project.

iii. Surface Mount (Biscuit) Outlets
   1. Surface Mount Outlets shall accept two or four connector modules and shall be used to support data applications in open office, retrofit, and other surface-mount environments. The use of surface mount outlets shall be approved by GSP IT.
   2. Surface Mount Outlets shall be compatible with the Category 6 connector module specified in this document.
   3. Surface Mount Outlets shall be installed in a NEMA 1 enclosure above accessible or exposed ceilings. Surface mount outlet shall be secured to the enclosure with metal fasteners, double-sided tape or magnets shall not be acceptable.
   4. Surface Mount Outlet shall be UL listed and shall be constructed of fire-retardant ABS plastic rated UL 94V-0.
   5. Connector modules for use in surface mount outlets shall follow the same color schemes for work area outlets.

4. Patch Panels
   a. Patch Panels shall be compatible with the equipment racks, cabinets or wall mount brackets specified for the project.
   b. Patch Panels shall be equipped with 8-position connector modules and shall allow for termination using both T568A and T568B wiring schemes.
c. Patch Panels shall be 48-port configuration for connector modules specified in this document. The connector module shall meet or exceed the Category 6 performance specified in this document.
d. Patch Panels shall be equipped with front labeling space to facilitate port identification.
e. Patch Panels SHALL be 2RU. High Density 48 Port, Modular Patch Panels

5. Patch Cords
a. Patch Cords shall be provided at all patch panels and workstation area outlets. A Category 6 patch cord/WAO cord shall be provided for each terminated port on the project regardless if the port will be active at the end of the project.
b. Exact length of patch cords shall be determined during the course of design. If at all possible, maximum length of patch cords shall be limited to 5 m (16').
c. Category 6 Patch Cords shall be 4-pair, 24 AWG solid copper alloy, fully insulated with a flame retardant thermoplastic material (such as PVC, or equivalent) with a modular RJ45 male plug connector equipped with eight gold anodized pins factory terminated at each end of the patch cord. Modular plug connectors will be snag free in design or will utilize a molded plastic boot to cover the modular plug tab.
d. The Category 6 patch cord/workstation cord shall meet specifications conforming to the horizontal cabling arrangement described above.
e. Patch Cords shall be factory manufactured and assembled. Field assembled patch cords shall not be allowed.
f. The following patch cord jacket colors shall be used to represent specific systems and/or applications:
   i. Gray – GSP Phones
   ii. Black – Workstations
   iii. Aqua – Wireless Access Points
   iv. Purple – Audio/Video
   v. Brown – UPS SNMP
   vi. Dark Green – Building Automation System
   vii. Blue – EASE/CUSS (Common Use)
   viii. Yellow – Flight Information Display Systems (FIDS)
   ix. Orange – CCTV Cameras
   x. Red – Access Control (ACX)
   xi. White – Paging Public Address
   xii. Pink – Tenant Internet
   xiii. Light Green – Tenant Phone
g. Length of patch cords shall be specified for each project. Minimum length of patch cord is 3 meters. Coordinate exact length and color of each patch cord with GSP IT during the design phase.

6. Separation of Copper cables from EMI Sources
a. Comply with recommendations from BICSI’s "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
b. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
   i. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
   ii. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
iii. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).

c. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
   i. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
   ii. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
   iii. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

d. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
   i. Electrical Equipment Rating Less Than 2 kVA: No requirement.
   ii. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
   iii. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

e. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
   i. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

7. Testing
   a. General
      i. All Category 6 cabling shall be bi-directionally tested using a Level III-compliant tester as defined in ANSI/TIA-1152.
      ii. Test equipment used shall have been certified calibrated by the manufacturer or an independent test and calibration firm, to the manufacturer’s specifications. Meter calibration shall be performed within one year of the testing date.
      iii. All cables shall be tested in accordance with ANSI/TIA standards, the Manufacturer’s Certification Program and best industry practice. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-B.1 and B.2, B.2-1 and B.3 (including all TSBs) testing and certification standards. The appropriate Level III tester shall be used to verify Category 6 cabling systems. The test protocols, testing approach and equipment will be contained in the test results documents.

   b. Category 6 Channel Testing
      i. Category 6 testing shall be of the Basic Link. However, the contractor shall warrant performance based on the Channel performance and provide patch cords that meet Channel performance. Testing shall be accomplished with a test set with a minimum spectral frequency range of 1 to 350MHz.
      ii. The basic tests required are:
         1. Wire Map
         2. Length
         3. Attenuation
         4. NEXT (Near end crosstalk)
         5. ACR (Attenuation to crosstalk ratio)
         6. Return Loss
         7. ELFEXT Loss
         8. Propagation Delay
         9. Delay skew
         10. PSNEXT (Power sum near-end crosstalk loss)
         11. PSACR (Power sum attenuation to crosstalk ratio)
12. PSELFEXT (Power sum equal level far-end crosstalk loss)

c. Documentation
   i. Detailed test results documentation data is to be provided in an electronic database for each Category 6 tested balance twisted-pair and shall contain the following information:
      1. The overall Pass/Fail evaluation of the link-under-test
      2. The date and time the test results were saved in the memory of the tester
      3. The identification of the customer site as specified by the end-user
      4. The name of the test limit selected to execute the stored test results
      5. The name of the personnel performing the test
      6. The version of the test software and the version of the test limit database held within the test instrument
      7. The manufacturer, model and serial number of the field-test instrument
      8. The adapters used
      9. The factory calibration date
     10. Wire Map
     11. Propagation Delay values, for all four pairs
     12. Delay Skew values, for all four pairs
     13. DC Resistance values, for all four pairs
     14. DC Resistance Unbalance, values for all four pairs
     15. Insertion Loss, worst case values for all four pairs
     16. NEXT, worst case margin and worst-case values, both directions
     17. PS NEXT, worst case margin and worst-case values, both directions
     18. ACR-F, worst case margin and worst-case values, both directions
     19. PS ACR-F, worst case margin and worst-case values, both directions
     20. Return Loss, worst case margin and worst-case values, both directions
     21. TCL, worst case values both directions
     22. ELTCTL, worst case values, both directions.

8. Labeling
   a. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
   b. Label each faceplate and patch panel port.
   c. See Appendix B – Labeling Requirements for more information.

9. Warranty
   a. The contractor shall certify and provide verification from the relevant manufacturer for every horizontal cable link installed in the project at project completion. If required, the Contractor shall engage third party to certify testing and commissioning of end-to-end installation.
   b. GSP IT requires that all installed cables and hardware are accompanied with a minimum 25-year manufacturer warranty. This includes all horizontal cable, terminations and hardware. It is the contractor’s responsibility to ensure that all warranty requirements are met and submitted according to manufacturer procedures, including all test reports, as-built drawings, bills of material, etc.
Telecommunication Grounding System

1. Design Requirements
   a. The purpose of a grounding system is to create a low resistance path that will carry electrical surges and transient voltages such as lightning, and electrostatic discharges to earth ground. A properly designed system is one that is visually verifiable, sized correctly for the expected currents, and directs potentially damaging currents away from equipment. Metallic component parts of the communication infrastructure such as equipment, cable trays, cabinets, racks, or blocks must be properly grounded and bonded.
   b. Design of the telecommunications grounding system shall be compliant with ANSI/TIA-607-C Commercial Building Grounding and Bonding Requirements for Telecommunications.

2. Building Single Ground Point
   a. A building’s single grounding point will be the building’s electrical service ground. This results in good contact with earth ground, and results in a low resistance to ground necessary for dissipating fault currents, lightning strikes, static discharges, electromagnetic frequency (EMF), and Radio Frequency Interference (RFI), safely into the earth.
   b. The bonding conductor between the building’s main grounding point and the TMGB in the MDF will be a minimum of #3/0 AWG, insulated (green jacket) conductor.
   c. The physical connection to the electrical service ground will be an exothermic weld, unless otherwise approved by GSP IT.
   d. NEC section 250-94 requires an intersystem bonding connection that is accessible at the electrical service equipment ground to effectively equalize the difference of potential between the power and telecom cabling.
   e. All connections will be an IEEE-837 approved irreversible type compression fitting.
   f. All non-conductive coatings such as paint, lacquer, and other electrically non-conductive coating must be removed from surface areas where connections are to be made to ensure a good electrical connection. The use of a star washer does not satisfy the requirement to remove non-conductive coatings from attachment surfaces.
   g. The resistance from the ground system to the physical earth ground shall be 25 ohms or less, and the resistance from the protector to the ground system (equipment ground) should be less than 1 ohm.

3. Telecommunication Bonding Backbone
   a. The Telecommunication Bonding Backbone (TBB) intended function is to equalize or reduce potential differences in the telecommunication system’s grounding and bonding infrastructure.
   b. The TBB will be a continuous 3/0 AWG cable from the TMGB to the TGB’s. Typically, the TBB will connect all TGB’s normally found in the building’s Entrance Room (ER) and in all IDF Rooms.
   c. The TBB will be installed as a continuous cable without splices.
   d. All connections to the TBB must be accessible and be made with irreversible compression fittings.
   e. Grounding and bonding conductors should not be placed in ferrous metallic conduit. If it becomes necessary to place grounding or bonding cable in a metallic conduit, the conduit shall be bonded at each end with a ground hub and minimum #6 AWG bonding conductor.
   f. Ground buss conductors must maintain a minimum bend radius as required by code. The angle of any bend must not be less than 90°.

4. Telecommunication Main Grounding Bus Bar
a. The Telecomm Main Grounding Bus bar (TMGB) serves as an extension of the building ground point for the purpose of grounding the telecommunications infrastructure.

b. The TMGB provides a central attachment point for all of the building’s Telecommunication Bonding backbones (TBB). The TMGB will be bonded to building grounding system and grounded to the electrical service ground according the current version of the NEC.

c. The TMGB will be found in the building’s ER or MDF if the building does not have an ER. The bonding conductor will be directly attached between the building’s single ground point, normally the electrical service ground at the building’s entrance, and the building’s ER or MDF.

d. The bonding conductor between the building’s main grounding point and the TMGB in the ER or MDF will be a minimum of #3/0 AWG, insulated appropriately colored conductor, utilizing an exothermic connection.

e. Provide a TMGB that is UL listed, 2” wide by 0.25” thick. The length of the TMGB shall be determined by the number of connections required but shall not be less than 12”. The TMGB shall accept two-hole lugs and be supported from the wall by stand-off brackets made of acceptable materials. The TMGB shall be located above the highest piece of wall mounted equipment to allow for adequate access for grounding conductors and connections.

f. The TMGB shall be insulated from its support and be capable of safely carrying powerful currents. Before a mechanical connection is made, the attachment area should be thoroughly cleaned prior to fastening of conductors. Apply anti-oxidant to the tongue of the connector before the bonding connection is made, to reduce corrosion and contact resistance.

g. All connections to the TMGB other than the main ground wire will be made through the use of UL listed 2-hole, irreversible compression lugs.

5. Telecommunication Ground Bar

a. The Telecommunication Ground Bus bar (TGB) serves as the single grounding and bonding point for all telecommunication systems and equipment located in that particular location’s IDF Room.

b. The TGB will be UL listed 2” wide by 0.25” thick. The length of the TGB shall be determined by the number of connections required but shall not be less than 12”. The TGB shall accept two-hole lugs and be supported from the wall by stand-off brackets made of acceptable materials. The TGB shall be located above the highest piece of wall mounted equipment to allow for adequate access for grounding conductors and connections.

c. All connections to the TGB other than the main ground will be made through the use of UL listed two-hole, irreversible compression lugs.

d. Each TBB that bonds a TGB to the building’s TMGB must be bonded with UL listed irreversible compression fittings.

e. Each TGB will be horizontally bonded to the electrical panel feeding power to the IDF. Provide a #6 AWG appropriately colored bonding conductor to the electrical panel ground.

f. Each TGB will be directly bonded to building structural steel if building structural steel is readily available with a #6 AWG appropriately colored bonding conductor.

6. Equipment Grounding

a. All equipment inside ER, MDF or IDF Rooms shall be bonded to the TGB with a #6 AWG appropriately colored bonding conductor. This includes, but is not limited to:
   i. Equipment Racks
   ii. Equipment Cabinets
   iii. Cable Runways
   iv. Wall Mounted Equipment and Panels
v. Conduits Entering Room containing copper backbone cables
vi. Ground bar of power panel serving power to the room

b. Equipment cabinets and rack shall be provided with a rack mount, copper busbar located at the top most rack mount unit. This busbar shall be connected to the TGB. The cabinet or rack and all active equipment installed shall be connected to the busbar.

c. Bond cable runway at each mechanical runway connection or joint using a #6 AWG jumper across each connection/joint, or an acceptable proven method to maintain continuity between equipment, i.e., joining of two pieces of ladder rack.

d. All non-conductive coatings such as paint, lacquer, and other electrically non-conductive coating must be removed from surface areas prior to making a physical connection to ensure a good electrical connection can be made. The use of a star washer does not satisfy the requirement to remove non-conductive coatings from attachment surfaces.

e. Prior to making a bonding connection, thoroughly clean the attachment area. Apply anti-oxidant to the tongue of the connector before attachment to the contact area in order to prevent corrosion and reduce contact resistance.
1. General Requirements
   a. To control the flow of announcement audio in the system, a programmable, microprocessor-based paging announcement control system has been installed at GSP. This control system provides a means to assign zones or multi-zone groups to entry codes using the selector buttons at each microphone station. Any new paging elements will be integrated with and controlled by the existing system. A dedicated computer workstation enables the configuration of the system to be programmed, revised, and monitored as required, using password-controlled access.
   b. Terminal and Concourse projects may require extension or modification to the existing public-address system at GSP. The system in place is a networked-based, distributed system with the ability to deliver live voice messages, scheduled playback of pre-recorded messages, live recording and playback of ad hoc messages, and visual paging messages to selected visual displays with associated voice messages delivered via the public-address system.
   c. This Section includes the minimum requirements for public address announcement and paging systems to be installed and interfaced to the existing systems as part of terminal and concourse renovations.
   d. All new work shall interface with the existing public-address system which is manufactured by Innovative Electronic Designs, Inc. (IED) and shall provide all equipment and cabling necessary for a complete and upgraded system.
   e. Sound distribution in the public areas of the concourse will be via distributed loudspeaker systems subdivided into logical zones that serve a common functional use. For example, all loudspeakers in one departure gate hold room area will be included in one zone. New loudspeaker zones will approximate existing zones in the concourse. Existing paging zones are indicated in the following table:

<table>
<thead>
<tr>
<th>Location</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ticketing Lobby</td>
<td></td>
</tr>
<tr>
<td>TSA Security Checkpoint</td>
<td>Including adjacent restrooms with queuing zones.</td>
</tr>
<tr>
<td>Airside circulation</td>
<td>Including adjacent restrooms.</td>
</tr>
<tr>
<td>Concessions Grand Hall</td>
<td></td>
</tr>
<tr>
<td>Airside Garden</td>
<td>Exterior.</td>
</tr>
<tr>
<td>Concourse A Gate Holdrooms</td>
<td>Separate zones for each holdroom.</td>
</tr>
<tr>
<td>Concourse A Circulation</td>
<td>Including restrooms.</td>
</tr>
<tr>
<td>Concourse B Gate Holdrooms (4)</td>
<td>Separate zones for each holdroom.</td>
</tr>
<tr>
<td>Concourse B Circulation</td>
<td>Including restrooms.</td>
</tr>
<tr>
<td>Non-Public Areas</td>
<td>Not provided except as specifically requested by Airport</td>
</tr>
</tbody>
</table>
2. Existing System Description
   a. Manufacturer and Model/Version
      i. The existing public-address system at GSP is an Innovative Electronics Designs (IED) GLOBALCOM XXXX Series Version X.X.
   b. System Architecture
      i. Virtual Server Environment
         1. The system architecture allows the use of a virtual server platform which will allow the facility to run multiple virtual machines on a single physical machine, with each virtual machine sharing the resources of that one physical computer across multiple environments.
      ii. Digital Audio Format (CobraNET)
         1. The system utilizes a Digital Audio Format protocol for audio transport. The core system is digital and does not utilize combinations of analog and digital circuits. At the first point of connection to the system, microphones and other program sources are digitized and remain in the digital domain until the final power amplifiers. This system utilizes an analog constant-voltage 70-volt distribution system from the power amplifiers and the speakers.
            a. The system is entirely software driven. No analog controls exist anywhere in the system that would allow unauthorized adjustments or users.
            b. Microprocessors manage and control all system functions and hardware including microphone communication stations, announcement queuing, telephone interfaces, distribution of emergency announcements, local announcements, terminal announcements, background music distribution, announcement recording, and messaging.
   c. Announcement Control System (ACS)
      i. The system features distributed processing, with multiple ACS software controllers. The ACS controller provides a network-centric architecture to minimize central head-end equipment. This eliminates the possibility of complete system failure should catastrophic failure happen in any one room or area. This distributed topology also allows for local interface terminations with other systems, rather than the need to route connections to a centralized headend location.
      ii. The Announcement Controller manages all primary operations of the ACS including paging communication stations, audio routing, message management and Ethernet communications. The Controller accepts standard VoIP protocols via two (2) native, simultaneous connections, and accommodates eight (8) additional inputs when separate third-party media converters are included. The physical controller includes Controller Software.
3. Hardware Requirements
   a. Networked Integrated Power Amplifier Systems
      i. Networked Power Amplifiers shall provide DSP processing and power amplification for the existing constant-voltage 70V speaker distribution system. Input/output channel capacity shall be calculated to serve defined speaker zones plus a minimum of 30% headroom for future system expansion. Features of the amplifier systems are:
         1. Digital Audio Interface
         2. Zone Manager
         3. DSP Processing
         4. Ambient Analysis and Control
         5. Power Amplifiers
         6. Automatic Backup Amplifier Switching
7. Internal Monitoring
8. Automatic Testing
9. Local Inputs

b. Digital Network Amplifiers
   i. Digital Network Amplifier (DNA) shall be a four (4) or eight (8) channel mainframe power amplifier device. The DNA shall be controlled via network commands to setup and adjust integrated features such as routing configurations, Digital Signal Processing (DSP) settings, delay, output levels, and ambient analysis compensation settings. The mainframe device shall be fully supervised, with any amplifier failures or environmental condition alerts being reported to the system’s fault logger program.

c. Ambient Noise Analysis and Control System
   i. In order to maintain a suitable sound distribution signal to background noise ratio with the varying background noise which is experienced in the terminal, automatic controls will be provided for loudspeaker output levels in selected areas of the terminal such as security queuing and screening, concourse, gate holdrooms, and concessions areas. The automatic controls are microprocessor-controlled audio attenuators directed by the level of ambient noise detected by remote noise sensors and above a configured threshold. The controls will not respond to short bursts of noise but rather to gradual change of ambient noise over an adjustable period.

   ii. Ambient Analysis Sensor Collector shall accept inputs from the ambient analysis sensors, process their data, and transmit the data to the appropriate amplifier system. Connection to the system shall be via an Ethernet port. The collector shall be rack mounted and accept inputs from up to 32 ambient noise sensors. The collector shall be powered through the PoE Ethernet Port or with an optional modular power supply.

   iii. Ambient Analysis Sensors shall detect ambient noise levels in respective speaker zones. Noise levels shall be processed using an A-weighted curve and converted to a DC waveform for transmission to the Ambient Analysis Sensor Collector.

d. Networked Microphone Communication Stations
   i. Dedicated announcement microphone paging stations will be provided for the system for the initiation of paging or other audio announcements. Microphone paging stations consist of a professional quality handheld or gooseneck microphone that is suitable for close talking; a solid-state preamplifier; a pushbutton keypad; and LCD/LED indicators. Different types of microphone paging stations are available:

      1. Full Function Microphone Communications Stations shall have a 12-button keypad for data entry, (8) soft function keys and a color graphical LCD. The station shall be a network appliance with control and CobraNet audio communicating on the audio network. Connection to the system shall be 100BaseT with power provided by a PoE switch port or PoE mid span power. Microphones shall be provided as handheld or gooseneck as required. Each microphone shall utilize a magnetic mount and include a line amplifier in the microphone shell to eliminate microphone signal levels beyond the microphones. Stations shall be provided in vertical, horizontal, surface, flush, or desktop based on the mounting situation required.

      2. Limited Function Digital Microphone Stations shall have (4) selection buttons. The station shall be a network appliance with control and CobraNet audio communicating on the audio network. Connection to the system shall be 100BaseT with power provided by a PoE switch port or PoE mid span power. Microphones shall be handheld and utilize a magnetic mount. Microphones shall include a line amplifier in the microphone shell to
eliminate microphone signal levels beyond the microphones. Stations shall be provided in surface wall-mounted (2-gang) or desktop versions based on the mounting situation required.

ii. Although exact types, quantities, and locations, are to be determined, proposed microphone paging stations are indicated in the following table:

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>QUANTITY</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal Ticket Counters</td>
<td>One per airline</td>
<td>Counter work surface, full function station</td>
</tr>
<tr>
<td>Gate Holdroom Counters</td>
<td>One per gate</td>
<td>Counter work surface, full function station</td>
</tr>
<tr>
<td>Gate Doors</td>
<td>One per gate</td>
<td>Wall mounted, limited-function station</td>
</tr>
</tbody>
</table>

e. Automatic Power Amplifier Backup Switching  
   i. The system shall detect a failure of an amplifier channel and shall electronically replace that amplifier without loss of service. Switching shall result in no loss or change of source or destination routing. Detection and switching shall take place in less than 2 seconds. A failure shall be reported immediately to the fault logging system.

4. System Interfaces and Features  
a. Fire Alarm System  
   i. The fire alarm system is interfaced with the paging system to allow the ability for the fire alarm system to override (mute) all but the highest priority emergency announcements from the paging system during a fire alarm condition.

b. Background Music  
   i. The system provides for connection and distribution of an airport provided background music program. Certain zones of the concourse may receive the distribution of separate, dedicated background music programming or no background music.

c. Flight Information Display System  
   i. The system includes a fully integrated interface with the airport Multi-User Flight Information Display System (MUFIDS) to provide increased integration and functionality. This interface supports the automatic transfer of flight record data to the paging system (required for Prerecorded Flight Announcements) and for implementation of visual paging functions. Basic MUFIDS functions may be changed from appropriate full-function microphone paging stations.

d. Visual Paging System  
   i. The system enables the display of text associated with prerecorded messages and text-to-speech announcements. Such visual paging messages would be distributed to dedicated visual paging displays or shared function displays as a portion of the Multi-User Flight Information Display System (MUFIDS).

e. Courtesy Announcement System  
   i. A Courtesy Announcement System provides the capability for system operator(s) to originate and log (for later recall) impromptu courtesy announcements in the terminal. Such announcements are typically made at the request of phone calls or people waiting in the
terminal (i.e. “Mr. Smith, please pick up a white courtesy phone for a message”). This capability is often beneficial in terminal call and/or operations centers.

ii. This system utilizes an application accessed from computer workstation(s) networked with the paging system. This application enables the operator(s) to select a message template, type in the name of the party being paged, use the text-to-speech function to generate the message, and direct the message (multiple times if desired) to selected paging zones. This system also enables such courtesy announcements to be directed to appropriate visual displays.

5. Speakers
   a. Distributed loudspeakers will primarily consist of ceiling mounted units appropriately spaced according to the ceiling height and surface mounted units, depending on the acoustical, aesthetic, and functional aspects of the area requiring coverage. More specialized loudspeaker types (i.e. line arrays) may be required for some acoustical environments.

6. Network (IP) Connectivity
   a. Ethernet communication between LAN-based paging system components (microphone paging stations, remote processing/power amplifiers) utilize two (2) separate logically-independent virtual local area networks (vLANs) for Data and Audio (CobraNet). All network requirements, including UTP copper and fiber cable, switches, and patch panels shall be furnished and installed as communications systems work.
   b. The paging system Data Network will be a standard TCP/IP network to be used for data communications and control between paging system devices. The Data Network shall be a Gigabit TCP/IP network; routed; Class C IP Address Scheme; no DHCP; and include remote VPN access for updates and troubleshooting purposes.
   c. The paging system Audio Network (CobraNet) shall be a non-routed TCP/IP network used to transmit audio between paging system devices using the CobraNet protocol. The Audio Network shall be a Gigabit TCP/IP network; non-routed (Data Link Layer, OSI Layer 2); no DHCP; 172.16.xxx.xxx/16 Address Scheme; no Port Security; Power over Ethernet (PoE) capability (IEEE 802.3af compliant); switches configured for full duplex operation with no physical network path from device to device with greater than six (6) switch hops; and highest Quality of Service (QoS).

7. Power and Cabling
   a. The paging system equipment is typically connected to an emergency power source (i.e. UPS and/or emergency generator) to provide protection from line transients and voltage fluctuations and support possible emergency announcement operational requirements.
   b. The cabling for paging system ambient noise sensors and loudspeakers will be installed in dedicated conduit or divided raceway (to prevent interference between different voltage signal levels). Plenum-rated loudspeaker cable (installed outside of conduit) will be used unless otherwise directed. Microphone paging station cabling (minimum Category 6 UTP) will be installed in conduit and common data cable trays.

8. Testing
   a. After installing public address system and after electrical circuitry has been energized, test for compliance with requirements.
   b. Operational Test: Perform tests that include originating program and page messages at microphone outlets, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and that system is free of noise and distortion.
   c. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings as follows:
      i. Disconnect microphone at connector or jack closest to it and replace it in the circuit with a signal generator using a 1000-Hz signal. Replace all other microphones at corresponding
connectors with dummy loads, each equal in impedance to microphone it replaces. Measure signal-to-noise ratio.

ii. Repeat test for each separately controlled zone of loudspeakers.
iii. Minimum acceptance ratio is 50 dB.

d. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1000, 3000, 8000, and 12,000 Hz into each preamplifier channel. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is 3 percent total harmonics.

e. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five locations in each zone. For spaces with seated audiences, maximum permissible variation in level is plus or minus 2 dB. In addition, the levels between locations in same zone and between locations in adjacent zones must not vary more than plus or minus 3 dB.

f. Power Output Test: Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.

g. Signal Ground Test: Measure and report ground resistance at public address equipment signal ground.
1. General Requirements
   a. Intercommunication substations are located at all vehicle gates that are controlled by the ACS and at entry doors to select remote buildings that do not operate on a 24/7 basis. The substations at vehicle gates provide direct, hands-free communication with the Airport Operations Center (AOC). The substations at remote building entry doors communicate with a master station located inside the respective building.
   b. The primary purpose of the intercommunication system at vehicle gates is to allow the user to communicate with the AOC operator in case of problems or the inability to open the gate/door. Intercommunication system shall not be interfaced to allow unlocking of gates or doors from the AOC unless approved by GSP PD.

2. Existing System Description
   a. Manufacturer and Model
      i. The existing intercommunication system is a multiservice system that can support both IP and analog substations. The system is manufactured by a Zenitel USA and is a Stentofon Alphacom E7.
   b. System Architecture
      i. The system is controlled from a Stentofon Alphacom E7 exchange located in existing IDF-2. The exchange is IP connected to a network switch located in the same IDF. Substations are either IP connected to the nearest network switch in the field or are direct connected to the exchange via the existing analog copper backbone. A software license is required for each IP substation.
      ii. Master stations are IP connected to the nearest network switch.

3. Hardware Requirements
   a. Sub-stations: Existing substations consist of both analog and IP substations.
   b. Master Stations: Existing master stations are IP connected.

4. System Interfaces and Features
   a. CCTV System
      i. The Intercommunication system and CCTV system can be integrated through a dry contact interface which allows for automatic camera call-up upon activation of a substation at vehicle gates and entry doors. This interface provides for automatic call-up of cameras on monitors at the Airport Operations Center (AOC) and the ability to see live video to aid in communication with the user.

5. Network (IP) Connectivity
   i. LAN equipment required for the communication of substations and master stations shall be provided by the Owner. Coordinate with GSP IT Department as required for network setup and configuration.

6. Cabling
   a. All wire and cable shall be Underwriter’s Laboratories (UL) listed, and shall meet all national, state and local code requirements for its application.
   b. All wire and cable shall meet individual system or subsystem manufacturer specifications.
   c. Intercommunication cabling may be installed on j-hooks above accessible ceilings. Cable shall be plenum rated.
   d. Category 6 cable shall meet the requirements defined in the horizontal cabling section of this standard.
7. Testing
   a. Testing of intercommunication system shall include, but not be limited to testing of the following features:
      i. Established call from substation to master station
      ii. Speaker volume at substation
      iii. Microphone volume at substation
      iv. Speaker volume at master station
      v. Microphone volume at master station
1. General Requirements
   a. Emergency telephone stations provide a direct dial connection to the GSP Airport Operations Center (AOC). Each station includes a hands free two-way communication station and integral blue light that alerts the user as to the location of call station and also flashes when the call station is in use.
   b. Depending on the location, different communication technology is used to connect the call station to the AOC:
      i. GSM Cellular (wireless)
      ii. Analog Station (direct hardline connection to analog port on VoIP system)

2. Existing System Description
   a. Emergency call stations have been installed in the following locations:

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>COMMUNICATION TECH</th>
<th>MOUNTING TYPE</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily Parking Lot</td>
<td>GSM Cellular</td>
<td>Pole</td>
<td>2</td>
</tr>
<tr>
<td>Economy Parking Lot</td>
<td>GSM Cellular</td>
<td>Pole</td>
<td>3</td>
</tr>
<tr>
<td>Cell Phone Lot</td>
<td>IP (VoIP)</td>
<td>Pedestal</td>
<td>1</td>
</tr>
<tr>
<td>Overflow Parking Lot</td>
<td>IP (VoIP)</td>
<td>Pedestal</td>
<td>2</td>
</tr>
<tr>
<td>Parking Garage A (Elevator/Stair)</td>
<td>Analog (Direct to Analog Port on VoIP)</td>
<td>Wall</td>
<td>5</td>
</tr>
<tr>
<td>Parking Garage B (Elevator/Stair)</td>
<td>Analog (Direct to Analog Port on VoIP)</td>
<td>Wall</td>
<td>5</td>
</tr>
<tr>
<td>Parking Garage B (Sidewalk)</td>
<td>Analog (Direct to Analog Port on VoIP)</td>
<td>Pedestal</td>
<td>1</td>
</tr>
</tbody>
</table>

   b. Manufacturer and Model
      i. The emergency call station system is a GAI-tronics Red Alert 300 Series system.
   c. System Architecture
      i. The system architecture varies due to the different communications technology that is used throughout the stations.
      ii. Cellular connected stations communicate directly to the AOC by using a GSM module installed at each station. A GSP provided SIM card is placed in each station to provide cellular subscription service. These stations are mounted to parking lot light standards and derive power from the lighting circuit through the use of night charge power supplies. Night charge power supplies provide continuous power to the ECSS unit from a non-continuous power source. In this case, the non-continuous power source will be the power serving the parking lot lighting fixtures. The use of cellular based call stations is only to be used in specific situations where power and data connectivity is not readily available.
      iii. Analog connected stations are hardwired with Category 6 cable to an analog copper backbone located in the nearest IDF that provides connectivity to the Terminal MDF. At this point the analog connection is cross-connected to analog ports on the ShoreTel VoIP system. Power for these units are provided from the nearest 120V power panel. The use of analog connected stations is the preferred solution in areas where an IDF Room is not within Ethernet cable distance limitations.
      iv. IP connected stations are hardwired with a Category 6 cable to the nearest network switch. These stations are IP-based stations that are direct connected to the VoIP system through the
network. Power for these units are provided from the nearest 120V power panel. The use of IP connected call stations may be acceptable depending on the application and must be approved by GSP IT.

v. Hardwired stations (both analog and IP connected) are monitored by GAI-Tronics Telephone Management Application (TMA). This software resides on a workstation in the AOC and is provides provide call history and reporting, system monitoring, troubleshooting and the ability to run self-tests.

3. Hardware Requirements
   a. Call Stations
      i. Speakerphone
         1. The unit shall be an outdoor-rated, vandal-resistant, ADA-compliant, full duplex, analog or IP (depending on application) speakerphone and intercom. It shall have user programming capabilities, auxiliary functions, fault monitoring and reporting.
         2. The unit shall be programmable from a remote location and have a two-number dialing capability per button, reverting to the second number if the first is busy or does not respond. The unit shall be totally hands-free on both sides after connection is initiated at site or by attendant.
         3. Weather-proof buttons that are self-monitoring shall be flush mounted in the faceplate bezel. A single black button shall be provided for each unit and shall be labeled "HELP". A light emitting diode (LED) shall be provided that will inform the caller that the call has been placed and received.
      ii. Pole Mount Station
          1. Provide an ADA compliant pole mount enclosure constructed of vandal-resistant cast aluminum or stainless steel. The enclosure shall house an ADA-compliant, analog speakerphone as specified above.
          2. Enclosure: brushed stainless steel or cast aluminum with impact-resistant polycarbonate lens and resistance to UV-fade. Coordinate exact paint color of enclosure with GSP.
          3. Signage: high reflective red “EMERGENCY” lettering with wide-angle visibility is standard.
      iii. Wall Mount Station
          1. Provide an ADA compliant wall mount enclosure constructed of vandal-resistant cast aluminum or stainless steel. An always-lit LED Blue Light shall provide high visibility of the unit. The enclosure shall house an ADA-compliant, analog speakerphone as specified above. The call station faceplate shall be illuminated at all times for clear visibility during the night.
          2. Enclosure: brushed stainless steel or cast aluminum with impact-resistant polycarbonate lens and resistance to UV-fade. Coordinate exact paint color of enclosure with GSP.
          3. Signage: high reflective red “EMERGENCY” lettering with wide-angle visibility is standard.
      iv. Free Standing Pedestal Station
          1. Provide an ADA compliant, free standing stanchion/pedestal mount constructed of highly vandal-resistant steel, with a LED blue light and lighted faceplate. The tower shall house an ADA-compliant speakerphone as specified above. The LED blue light shall be continuously lit and shall flash for the duration of a call when emergency button is pressed on the communication device. The communication device shall be capable of activating optional peripheral devices (i.e. activating a preset on a PTZ dome camera).
          2. Enclosure: brushed stainless steel or cast aluminum with impact-resistant polycarbonate lens and resistance to UV-fade. Coordinate exact paint color of enclosure with GSP.
          3. Signage: high reflective red “EMERGENCY” lettering with wide-angle visibility is standard.
4. CCTV Camera: Pedestal stations are capable of being supplied with a camera mounting hook that extends above the top of the pedestal. Coordinate requirements and need for camera with GSP. Camera shall meet requirement as identified under the CCTV section of these standards.

v. Blue Lights
1. Blue light strobes shall be placed at all call stations. Call stations located in surface parking lots shall be provided with a remote blue light that is extended above the speakerphone unit to allow the light to be seen above larger vehicles. Wall mount call stations located in parking garages and stanchion/pedestal enclosures shall have a blue light that is integral with the call station and speakerphone enclosure.

2. Blue lights shall be designed with a combined constant-on and flashing operation. The constant-on operation will occur when external power is applied. The strobe shall connect to a control output of the speakerphone that will initiate the flashing operation when the telephone is active. The flash shall remain active until the call is ended at which time the strobe shall return to a constant-on state. Mounting: enclosure and blue light shall be mounted directly to a pole.

vi. Cellular Connectivity
1. Cellular based call stations shall only be used where power or data cable infrastructure doesn’t exist or the ability to provide power and data cable infrastructure is not cost efficient. The use of cellular based call stations shall be approved by GSP IT prior to specification.

2. The GSM cellular interface shall provide a wireless connection from the speakerphone to the Airport existing VoIP telephone system. The interface shall route incoming and outgoing calls through a GSM wireless network.

3. GSP shall provide SIM cards for GSM cellular interfaces. Coordinate exact type/style of SIM card required with GSP IT.

4. GSP shall provide cellular data subscription service for GSM cellular interfaces.

vii. Power Requirements
1. Power: depending on the location of the call station, power requirements for the call stations shall fall under two categories:

2. Night Charge Power Source: call stations to be located in open air, surface parking lots shall be externally powered via a night charge system switching between AC line voltage and a battery source. The night charge unit is specified elsewhere in this specification.

3. 120VAC Power: call stations located in parking garages shall be powered via local 120VAC power. Provide transformers/power supplies as required to provide proper supply voltage.

4. Line powered phones that acquire power from the telephone circuit are not allowed on this project.

viii. TVSS
1. Provide transient voltage surge suppression (TVSS) on all hardwire connected speakerphone units. TVSS shall provide protection of both communication and power connections for all ECSS units.

b. Master Stations
   i. Head-End Configuration and Programming

4. System Interfaces and Features
   a. CCTV System
      i. Camera shall meet requirement as identified under the CCTV section of these standards.
ii. CCTV cameras shall be mounted to camera masts attached to the call station pedestals. Upon activation of a call station the attached CCTV camera shall pan-tilt and focus to the person using the call station. Cameras located at nearby pedestals shall also pan-tilt and focus to the call station in use.

b. VoIP telephone System
   i. Provide Voice over IP (VoIP) Interface for analog speakerphones. The interface shall integrate seamlessly with the GSP ShoreTel VoIP phone systems and support all major VoIP protocols.

5. Cabling
   a. All wire and cable shall be Underwriter’s Laboratories (UL) listed, and shall meet all national, state and local code requirements for its application.
   b. All wire and cable shall meet individual system or subsystem manufacturer specifications.
   c. Call station cabling shall be installed in conduits for exterior applications and may be installed on j-hooks above accessible ceilings if run inside buildings.
   d. Category 6 cable shall meet the requirements defined in the horizontal cabling section of this standard.

6. Testing
   a. Testing of emergency call stations shall include, but not be limited to testing of the following features:
      i. Established call from stanchion to AOC
      ii. Speaker volume at stanchion
      iii. Microphone volume at stanchion
      iv. Caller ID display at AOC
      v. Call Placed LED constant on during stand-by
      vi. Call Placed LED flashing during call in progress
      vii. Blue light constant on during stand-by
      viii. Blue light flashing during call in progress.
      ix. Rollover to 911 if AOC busy or does not respond.
      x. Confirm test calls are logged in to maintenance software reports.
   b. Testing of the management software shall include, but not be limited to the following features:
      i. Automatic polling of speakerphones.
      ii. Monitor and report status, health and activity of speakerphones.
      iii. Report speakerphone faults, line faults, cellular faults, etc.
      iv. Capable of sending an email when faults arise.
      v. Capable of generating reports of all call logs, faults, etc.
      vi. Software shall support analog, cellular and VoIP speakerphones.
      vii. Confirm database setup for each phone.
      viii. Review properties for each phone:
          1. General
          2. Behavior
          3. Call-in configuration
          4. Fault indicators
          5. Memory configuration
      ix. Review polling configuration
      x. Review report configuration:
          1. Maintenance calls report
          2. Polling exception
          3. Call in report
4. Inactive phone report
5. VoIP alarm notification
xi. Review email alert setup
xii. Review "out-of-service" feature
xiii. Review maintenance log feature
Multi-User Flight Information Display System (MUFIDS)

1. General Requirements
   a. The MUFIDS includes the equipment and software necessary to display flight, visual paging, advertising and full motion video information as well as other types of displayed information of the GSP’s choosing. Software programs, modules and necessary enhancements shall be provided as necessary to meet all of the functionality requirements.
   b. The format for a display and set of displays (display bank) shall be fully dynamic. The format of an individual display or set of displays shall change as required to accommodate various conditions.
   c. The system shall display visual paging information and video advertising information to the designated displays as required.
   d. The system shall be capable of displaying all media formats (Flight Information, Advertising (images and video), Visual Messaging and Emergency Messaging) on the display hardware as identified in this section.

2. Existing System Description
   a. Manufacturer and Model
      i. The existing MUFIDS is an Amadeus (formerly AirIT) FIDS system. Software version XXXXX.
   b. System Architecture
      i. Communication from existing MUFIDS head-end servers to displays shall be IP over an existing local area network.
      ii. Display Device Controllers (DDCs) shall be used by the MUFIDS to control the display output of video monitors. Each DDC shall have a unique TCP/IP address and shall communicate via the LAN via an Ethernet NIC.
   c. All programming, system configuration and set up is proprietary and is to be completed by the existing System maintenance service provider, Amadeus Airport IT Americas (AirIT).

3. Display Locations
   a. Display monitors will be located at, but not be limited to the following areas:
      i. Terminal Entries
      ii. Ticketing Areas, including general circulation areas and above ticket counters;
      iii. Holdroom including general circulation areas
      iv. Gate Counters;
      v. Baggage Claim areas, including general area and at each baggage claim carousel.

4. Display Format Requirements
   a. Display formats for the MUFIDS shall be fully configurable and dynamic.
   b. Flight Information Display (FID) Monitors consist of banks of four digital display monitors configured in a 2 x 2 mounting format in ticketing and holdroom general circulation area. FIDS monitors shall be configured to show the following:
      i. Departures Information
      ii. Arrivals Information
      iii. FlightAware (Live tracking maps, flight status, weather and airport status)
      iv. Video Advertising and General Passenger Information
   c. Ticket Counter Information Display Monitors screens shall be based on shared use concepts and will allow for displaying the name and logo of the airline and specific boarding class information.
d. Gate Counter Information Display shall be based on shared use concepts and will allow for displaying the name and logo of the airline, flight number and destination information, and flight status.

e. Baggage Information Display Monitors (General Area) shall display a complete listing of arriving flights over a two-hour window. Displayed information shall include, but not be limited to:
   i. current local time;
   ii. airline logo;
   iii. flight number;
   iv. originating airport;
   v. baggage claim number

f. Baggage Information Display Monitors (Carousel) shall be based on common use concepts and shall display the name and logo of the airline, flight number, arrival time, and originating city.

5. Visual Paging
   a. The public-address system visual paging software shall be fully integrated with the MUFIDS software.
   b. Any display device connected to the MUFIDS shall be capable of being utilized to display visual paging information.
   c. Visual paging messages shall be displayed as a banner on the Arrivals and/or Departures display monitor.

6. Full Motion Video
   a. The MUFIDS shall have the capability to display full-motion video (minimum 30 frames per second) on all video monitors throughout the system. The video functions can be managed from the existing MUFIDS System Administrator Workstation.

7. Hardware Requirements
   a. General
      i. All hardware requirements given are the minimum requirements. Product shall meet or exceed these requirements. Additionally, the hardware selected shall meet the operational, functional, and performance requirements specified herein.
   b. Digital Displays
      i. Sizes:
         1. FIDS and BIDS display monitors for use in general areas shall be 55” diagonal, minim.
         2. Ticket and Gate Counter displays shall be 46” diagonal, minimum.
      ii. Monitors shall have an aspect ratio of 16:9.
      iii. Display format resolution shall be at least 1920 x 1080 non-interlaced at minimum 120 Hz vertical scan.
      iv. Viewing angle in the horizontal and vertical plane with respect to the monitor baseline shall be no less than 178 degrees.
      v. Brightness: capable of at least 450 nits
      vi. Refresh Rate: No more than 12 ms
      vii. Monitor and controller shall be capable of displaying at least 65,000 colors simultaneously from a palette of at least 16.7 million colors.
      viii. Power: 115 VAC, 60 Hz auto switching.
      ix. Controls: Adjustments shall also be controllable via multi-user flight information data system (MUFIDS) or passenger processing system software.
      x. Remote Operation: Provide addressable infrared remote control for tuning of adjustable parameters.
xi. External Interfaces: power in shall be standard IEC socket with separate mains on/off switch, network connection shall be an Ethernet 10/100 Base RJ-45, video connectivity shall include a VGA 15-pin D-sub parallel port, DVI and HDMI port. Video connectivity to DDC shall be via DVI or HDMI.

xii. Backlight: LED

xiii. Reliability: The backlight lifetime (to ½ brightness) shall be rated at no less than 50,000 hours.

xiv. Mounting: VESA patterns, 400 x 400 or 300 x 300

xv. Bezel: no more than 18 mm

xvi. Rated for 24/7/365 continuous operation

c. Display Device Controllers (DDCs)
   i. DDCs shall be ultra-compact form factor and meet the following minimum requirements:
      ii. Intel Core i3-321 7U 2.6 GHz, Dual Core with 3MB Cache
      iii. 4GB Dual Channel DDR3 1066MHz RAM
      iv. 40 GB mSATA Solid State Hard Disk Drive
      v. 10/100/1000Mbps Ethernet NIC (auto-negotiating)
      vi. Intel HD Graphics 630 integrated high-speed graphics
   vii. Capable of driving multiple displays
   viii. Capable of minimum 1080P resolution on all displays.
   ix. Ports – (2) USB 3.0, (2) HDMI 2.0a

d. Tug Input Controllers (TIC)
   i. TICs shall be provided at all inbound baggage conveying systems to allow local control and update of baggage claim and BIDS display monitors. These units will require command and control interface with the system database which will distribute select information updates to BIDS monitors.
      ii. The TICs provide a list of flights to select from on an LCD display. The TIC shall not provide an input to the existing baggage conveyor control system.
   iii. TICs shall be programmable, touch screen units including:
      1. 10.4” diagonal color TFT LCD display with 65k colors
      2. 640x480 pixel resolution
      3. 50,000-hour average backlight lifetime, user replaceable
      4. 120VAC power adapter
      5. 10 MB project memory
      6. NEMA 4 rated enclosure, lockable
      7. 10/100BaseT Ethernet communication

8. System Interfaces and Features
   a. The MUFIDS system will be integrated with the Shared Use systems to ensure that accurate and up to date flight arrival, departure, and bag claim information is displayed.
   b. The MUFIDS shall supply an XML data feed for external system use of flight information data display purposes, such as the Airport website or future passenger processing systems.
   c. The MUFIDS shall be fully integrated with the public-address system for visual paging.

9. Network (IP) Connectivity
   a. LAN equipment required for the communication of DDC units shall be provided by the Owner.
      Coordinate with GSP IT Department as required for network setup and configuration.

10. Cabling
a. All wire and cable shall be Underwriter’s Laboratories (UL) listed, and shall meet all national, state and local code requirements for its application.

b. All wire and cable shall meet individual system or subsystem manufacturer specifications.

c. Category 6 cable shall meet the requirements defined in the horizontal cabling section of this standard.

11. Testing

a. Project Testing:
   i. Proper function and information display on public displays
   ii. System is performing within defined parameters.
   iii. Each display and associated peripheral equipment set shall be commissioned using AirIT certified commissioning program.

b. Test Plan/Procedure: The test plan for each phase of testing shall detail the objectives of all tests. The tests shall clearly demonstrate that the system and its components fully comply with the requirements specified herein. The test plan shall be provided at least thirty (30) days prior to the scheduled start of each test. Test plans shall contain at a minimum:
   i. Functional procedures including use of any test equipment
   ii. Test equipment is to be identified by manufacturer and model
   iii. Interconnection of test equipment and steps of operation shall be defined
   iv. Test records shall include test equipment serial number, calibration date and calibration certification of test equipment
   v. Expected results required to comply with specifications
   vi. Traceability matrix referencing Specification requirements with specific test procedures
   vii. Record of test results with witness initials or signature and date performed
   viii. Pass or fail evaluation with comments.
Common Use System

1. General Requirements
   a. The Common Use System provides a set of tools, software and equipment to maximize access and allocation of resources, including ticket counters, gate counters, boarding facilities, baggage claim, and other facilities in a non-proprietary environment shared by all airlines at GSP.
   b. The system consists of common use terminal equipment (CUTE), common use passenger processing systems (CUPPS) and common use self-service systems (CUSS) located at check-in and passenger processing locations at the ticketing and gate areas.
   c. The system supports a common use, non-proprietary environment for managing GSP Airport and airline operations, including equipment and software suitable for deploying ticketing and boarding operations which are open to any airline operating within the terminal, whether regularly scheduled or charter operation; and core software for managing and tracking all operational data, creating flight schedules, managing and assigning resources, and for tracking usage of GSP facilities by airlines for purposes of billing and financial management.

2. Existing System Description
   a. Manufacturer and Model
      i. The existing common use system is an Amadeus (formerly AirIT) FIDS system. Software version XXXXX.
   b. System Architecture
      i. Communication from existing common use head-end servers to displays shall be IP over an existing local area network.
      ii. All programming, system configuration and set up is proprietary and is to be completed by the existing System maintenance service provider, Amadeus Airport IT Americas (AirIT).
   c. The Common Use System includes the following elements:
      i. Airport Operational DataBase (AODB);
      ii. Resource Management System (RMS);
      iii. Flight Schedule Management System (FSMS);
      iv. CUPPS equipment, including:
         1. agent facing positions – ticketing;
         2. agent facing positions – gates; and
         3. administrative systems; and
         4. CUSS kiosk equipment;

3. Software and System Requirements
   a. The AODB and RMS shall manage and monitor all airport operational activities and use of airport facilities. This shall include the following characteristics and elements:
      i. The AODB/RMS shall be Oracle-based, built on a Service Oriented Architecture (SOA) with XML-based messaging.
      ii. The AODB/RMS shall interface to external data sources, including Departure Control Systems (airline hosts), SITA, SABRE, CAA, LDCS and others necessary to manage all operations.
      iii. The system will interface to the MUFIDS system via the Flight Schedule Management System.
      iv. The system will interface to the Baggage Handling System to track first bag, last bag status.
v. The RMS portion of the AODB shall build schedules for airport resource usage (ticket counters, gates, bag claims, etc.) based on Flight Schedule information, and shall activate these facilities according to that schedule upon log-in by an airline representative to a workstation associated with each resource.

b. Flight Schedule Management System (FSMS): The FSMS will interface to Airline Host systems and the Local Departure Control System to provide flight scheduling based on Season, Week, and Day-of operations.
   i. The FSMS will interface to the MUFIDS system to provide all information display data.
   ii. The FSMS will be rules-based for development of flight schedules

c. Local Departure Control System (LDCS): Provide software and hardware to allow irregularly scheduled aircraft to be scheduled as part of the AODB/RMS, and FSMS system

4. Hardware Requirements
   a. General
      i. All hardware requirements given are the minimum requirements. Product shall meet or exceed these requirements. Additionally, the hardware selected shall meet the operational, functional, and performance requirements specified herein.
      ii. Provide all interface/emulation software necessary to operate the CUTE/CUPPS equipment.
   b. Agent Facing Positions – Ticketing Counters
      i. Ticket counter agent facing positions shall be equipped, but not limited to the following equipment:
         1. agent workstation with screen (24-inch minimum), keyboard, mouse, CPU and software;
         2. ticket printer;
         3. bag tag printer;
         4. passport reader;
         5. magnetic stripe reader, PCI compliant;
         6. document printer configurable to serve two or more agent facing positions;
         7. laser scan reader
   c. Agent Facing Positions – Gate Counters
      i. Gate counter agent facing positions shall be equipped, but not limited to the following equipment:
         1. agent workstation with screen (24-inch minimum), keyboard, mouse, CPU and software;
         2. ticket printer;
         3. boarding gate reader;
         4. laser scan reader;
         5. passport reader;
         6. magnetic stripe credit card reader, PCI compliant;
         7. document printer configurable to serve two or more agent facing positions
   d. Self-Service Kiosks
      i. CUSS kiosks shall include, but not be limited to:
         1. 17-inch digital color monitor with touch screen capability;
         2. passport reader;
         3. 1D/2D barcode scanner;
         4. magnetic stripe credit card reader, PCI compliant;
         5. ticket printer, using standard stock;
         6. baggage tag printer

5. System Interfaces and Features
a. The Common Use System is currently integrated with multiple systems including, but not limited to:
   i. Multi-user Flight Information Display System (MUFIDS)
   ii. Airline Data Feeds
   iii. IATA Messaging
   iv. Resource Management
   v. Baggage Information
b. The Common Use System will be integrated with the MUFIDS to ensure that accurate and up to date flight arrival, departure, and bag claim information is displayed.

6. Network (IP) Connectivity
a. LAN equipment required for the communication of DDC units shall be provided by the Owner. Coordinate with GSP IT Department as required for network setup and configuration.

7. Cabling
a. All wire and cable shall be Underwriter’s Laboratories (UL) listed, and shall meet all national, state and local code requirements for its application.
b. All wire and cable shall meet individual system or subsystem manufacturer specifications.
c. Category 6 cable shall meet the requirements defined in the horizontal cabling section of this standard.

8. Testing
a. Each Systems workstation and associated peripheral equipment set shall be demonstrated and fully tested to meet basic functionality and airline operational requirements.
b. Each Systems workstation and associated peripheral equipment set shall be commissioned using AirIT certified commissioning program.
c. All workstations and associated peripheral equipment set shall be tested to meet operational requirements for each airline and to allow any airline to operate at any Ticket Counter.
d. Test and demonstrate each workstation’s integration with the existing Systems and each participating airline application.
Access Control System (ACS)

1. General Requirements
   a. This section specifies the minimum requirements for access control, door alarms, intrusion detection, and monitoring and control provision. Provisions for ACS shall follow DHS/TSA security regulations and the Airport Security Program (ASP). Areas not intended for passenger access (i.e. back-of-house) shall be controlled via ACS. CBP perimeter and identified passenger processing, offices, and control rooms shall be controlled with ACS. TSA regulated portals shall be controlled with ACS per the ASP.
   b. This standard addresses the extension of an existing distributed ACS system. The ACS components are specified here to be compatible with the existing ACS system. Operating features of hardware and software specified in this section are intended to limit the ACS components to compatible Andover Continuum equipment.

2. Secure Identification Display Area (SIDA) Line
   a. The SIDA line denotes the demarcation line from unsecured to secured areas. Any door or portal that lies on the SIDA line is required to be controlled and monitored by the ACS. As part of the design process the SIDA line shall be depicted on all design documents and reviewed with GSP. For enhanced security it is recommended that a fixed CCTV camera monitor all doors and portals that allow access to the secure side of the airport.

3. Existing System Description
   a. Manufacturer and Model
      i. The existing ACS was installed by i-Sys Corporation (now Convergint Technologies) in 2010, the hardware and software is manufactured by Andover Continuum (now part of Schneider Electric). The system includes an integrated credentialing system.
   b. System Architecture
      i. The ACS is an enterprise-wide, distributed, LAN-based system with dual, redundant servers. ACP’s are located in IDF Rooms and are connected to the head-end via an Ethernet connection to a virtual LAN. The ACP’s communicate with reader modules (RM) located at the door. The RM provides communication, control and monitoring of security door devices: proximity-type card reader, door position switches, electronic locking device, bond sensor, request-to-exit devices, etc.

4. Approved Security Integrator and Security Allowance
   a. The ACS system is maintained through an annual service agreement with Convergint Technologies. In order to ensure Convergint Technologies is responsible for the furnishing, installation, programming and testing of the ACS extension required under any project, it is recommended that an allowance figure be established for all ACS work. This allowance figure will be developed by the design team, compared with a pre-bid estimate prepared by Convergint Technologies and put into the bid as a Security Allowance. The ACS specifications will denote Convergint Technologies as the Airport’s “certified security contractor” to be used for the project.
   b. Access Control Panels
      i. Communication Availability: 10 Base-T, TCP/IP, Ethernet Compliant. Provide dual Ethernet network interface cards for communication to the local area network in a redundant mode.
      ii. Capacity: Provide ACP with two (2) Access Control Modules (ACM) to support the following devices and I/O:
         1. Card Readers: 16
2. Supervised Inputs: 16
3. Outputs (Suitable for Door Control): 8
   iii. Enclosure: 16 ga steel with tamper switch, hinged, lockable cover with tamper switch. Tamper switch shall be monitored.
   iv. Power Requirements: Input: 90-240VAC, 0.5A Max. Output: 12VDC @3.3A maximum.

C. Input/Output Modules
   i. Combines the functions of two xP Expansion modules:
      1. Universal Inputs: 4
      2. Digital Outputs: 4
   ii. Provide all required expansion I/O modules as needed to support, monitor and control all points and devices on the project.

d. Power Supply and Battery Back-up
   i. Provide a dedicated power supply for the ACP and a separate, dedicated power supply for door hardware.
   ii. ACP Power Supply:
      1. Input Power 120-220VAC. 50/60Hz, 2.5A, max.
      2. Output Power 13.8VDC, 3.75A.
      3. Battery backup: Provide sufficient battery backup to power the ACP for a period of not less than eight (8) hours. Provide the following alarm outputs and connect to input of assigned ACP for transmission of trouble signal to system head-end:
         a. AC Fault on blown fuse.
         b. Low Battery (below 10.3 VDC)

5. Secured Door Hardware
   a. Electrified Locking Door Hardware
      i. Electrified door hardware is typically selected and specified by the architect (reference Appendix A for approved door hardware). The security system designer shall meet with the architect to coordinate the use of electrified door hardware on each secured door. Secured door details developed as part of the security design shall depict the exact type of electrified door hardware used for each door type.
      ii. It is the security system designer’s responsibility to work closely with the architect to identify any door that is considered an emergency egress door. These doors require special consideration when it comes to the use of locking hardware, how that hardware is interfaced to the ACS and fire alarm system for emergency release and requirements for any emergency override device that will allow the door to unlock regardless of control from the ACS or fire alarm system. All access control and locking arrangements shall meet the current Life Safety Code and International Building Code in place at the time of the project.
      iii. Electrified door hardware shall be specified as furnished and installed by Division 8 contractor, wired by Division 28 contractor.
   b. Door Hardware Power Supply
      i. Multi-output power supply sized to support connected door hardware load.
      ii. Input power 120VAC.
      iii. Battery backup: Provide sufficient battery backup to power the door security devices connected to that ACP for a period of not less than eight (8) hours.
iv. Output power eight (8) individually fused 12 or 24VDC outputs for lock power, one (1) fused output (voltage and power as required) to power ACP.

v. Two (2) NO outputs, loss of AC and low battery.

vi. Diagnostic LEDs for power and blown fuse indication.

vii. Cabinets shall be lockable and provided with tamper switches. Provide signage warning that an alarm will sound if access is attempted and giving the telephone number of the security monitoring desk.

c. Card Readers

i. Provide card reader with integral keypad at secured doors. Card readers are typically only provided on the unsecure side of the door/portal. A request-to-exit (REX) device is provided on the secure side to shunt the ACS alarm when the door is opened without a valid card read.

ii. The card readers shall be capable of reading existing Airport HID iClass cards (reference Appendix A for card reader specifications)

iii. Keypad: 12 button, weatherized keypad built-in to the card reader.

iv. Mounting: Reader shall mount to a standard single gang mounting plate attached to a double-gang outlet box.

v. Interface Technology: iClass, FIPS 201 compliant, 13.5MHz contactless smart card technology. Match existing readers at airport.

d. Door Position Switches

i. Door position switches (contacts) shall be specified by the architect as part of the door hardware specification. Door position switches shall be specified as furnished and installed by Division 8 contractor, wired by Division 28 contractor.

e. Request-to-Exit Devices

i. Depending on the application and electrified door hardware selected by the architect, the provision of a separate device may be required to provide a REX signal to the ACS when a secured door is opened from the secure side. Some electrified door hardware has the REX contacts built into the hardware that eliminate the need for a separate REX device. If hardware does not contain these contacts (electromagnetic locks for example) then one or both of the following will need to be provided:

ii. Passive Infrared Motion Detectors

1. Passive Infrared (PIR) Motion Detectors shall be located on the secure side of doors to provide REX input to ACS.
2. 12 or 24 VAC or VDC operation (typical 26 mA @ 12 VDC).
3. Two form "C" contacts.
4. Relay latch time adjustable up to 60 seconds.
5. Operating temperatures of -20 degrees to + 120 degrees F.
6. Externally visible activation LED.
7. Adjustable "look down" coverage pattern to minimize nuisance activations.

iii. Request-to-Exit Pushbuttons

1. REX pushbutton shall be located on the secure side of the door. The REX button will act as a lock device override in the case that the ACS and/or card reader does not unlock the door when accessed from the secure side.
2. Stainless steel, heavy duty type pushbutton and cover plate. Minimum pushbutton diameter shall be 2.5 inches or as required by code
3. DPDT contacts, rated 4A.
4. Rated for outdoor locations. Provide proper backbox and cover plates for outdoor applications.
5. Pushbutton color: GREEN
6. Time-delay: Adjustable from 1 to 30 seconds
7. Continuously illuminated with positive visual feedback of successful activation.

f. Audio/Visual Alarms
   i. Provide combination audio/visual alarm indicator units at all secured door locations that allow access to the secure side. Coordinate exact side of door to place A/V alarm with GSP. Audio/visual must remain on until properly cleared by designated District personnel (via valid card access at the alarming door).
   ii. Manufacturer: System Sensor #P4W-P
   iii. Wall mounted, white in color w/ no labeling so that it will not be confused with fire alarm units.
   iv. Audible: Selectable tones and dB levels. Tone selection shall be coordinated with fire alarm provider so that the ACS audible is different from the fire alarm.
   vi. Voltage: 24vdc coordinated with active ACS components and power supplies.

6. System Interfaces and Features
   a. CCTV System
      i. The ACS and CCTV system are integrated through a software interface which allows for automatic camera call-up upon ACS alarm at specific secured doors. This integration provides for automatic call-up of cameras on monitors in the Airport Operations Center (AOC) and the ability to see live and digitally recorded video upon receipt of an alarm from the ACS. The Graphical User Interface (GUI) for the security systems shall be updated to reflect any new or modified floor plans and device locations.

b. Fire Alarm
   i. Fire alarm addressable relays shall be provided at all door hardware power supplies for automatic release of electrified locking devices on emergency egress doors. Coordinate with fire alarm designer for location and quantity of relays required.

c. Duress Alarms
   i. Duress alarm buttons/switches are provided at certain areas where a silent alarm is required to alert the AOC. Security checkpoints, reception desks, information centers are some examples of areas where these duress alarms have been provided. Coordinate location of duress alarms with GSP.
   ii. Duress Button shall be provided for initiation of silent alarm to ACS.
   iii. Manufacturer: Sentrol/GE Interlogix #3040
   iv. Construction: ABS plastic
   v. SPDT contacts
   vi. Surface Mount

d. Automatic Defibrillator (AED)
   i. AED cabinet doors are monitored by the ACS. A cabinet door tamper switch shall be provided with all AED cabinets. These switches shall be monitored as a discrete input to the ACS and provide an alarm when the cabinet door is opened.

7. Head-End Configuration and Programming
   a. The Approved Security Integrator shall provide all required programming, software and graphic map updates required for the extension of the ACS. All programming, software updates, database modifications, graphic user maps, etc. shall be provided and installed/programmed by an authorized and certified Andover Continuum representative.
8. Network (IP) Connectivity  
   a. LAN equipment required for the communication of ACP panels shall be provided by the Owner. Coordinate with GSP IT Department as required for network setup and configuration.

9. Conduit and Cabling  
   a. All wire and cable shall be Underwriter’s Laboratories (UL) listed, and shall meet all national, state and local code requirements for its application.
   b. All wire and cable shall meet individual system or subsystem manufacturer specifications.
   c. All ACS wire and cable shall be installed in conduit. Conduit shall be either labeled or color coded (same color as cabling) to specify the conduits use (i.e. Access Control).
   d. All cable carrying data or voice transmissions shall be shielded. All other cable shall be shielded where necessary for interference-free signals.
   e. Insulation shall be rated for a minimum of 300 V.
   f. Color coding shall be accomplished by using solidly colored insulation. Grounding conductors, where insulated, shall be colored solid green or identified with green color as required by the National Electric Code (NEC).
   g. The use of composite or “Smart Wire” is recommended for cabling from the ACP to the secured door. Composite wire contains cabling for each device at the door (card reader, lock hardware, REX device, door contact) under an overall jacket.
   h. Because all security cabling is to be installed in conduit, CMR cable is approved for use.

10. TVSS Protection  
    a. TVSS protection is required for any ACP and connected field devices that are installed in an exterior environment.
    b. All inputs shall be protected against surges induced on device wiring. Outputs shall be protected against surges induced on control and device wiring installed outdoors and as shown. All communications equipment shall be protected against surges induced on any communications circuit. All cables and conductors, except fiber optics, which serve as communications circuits from the ACP to field equipment, and between field equipment, shall have surge protection circuits installed at each end.

11. Testing  
    a. The Approved Security Integrator shall submit a Test Plan for Installation and Acceptance Tests for the review and approval of the designer and GSP IT. The test plan for each phase shall detail the objectives of all tests. The tests shall clearly demonstrate that the system and its components fully comply with the requirements specified herein. Test plans shall contain at a minimum:
       i. Test equipment is to be identified by manufacturer and model
       ii. Interconnection of test equipment and steps of operation shall be defined
       iii. Expected results required to comply with specifications
       iv. Record of test results with witness initials or signature and date performed
       v. Pass or fail evaluation with comments
    b. The ACS will be operationally tested using valid and invalid cards with the ACP in the on-line and off-line mode. The communication status of the ACP shall not matter during these tests. After completion of off-line tests, the ACP will automatically download to the server all events that occurred while off line.
    c. Tamper switches will be actuated on security enclosures so equipped. The removal or opening of a cover from a tamper equipped box shall result in a tamper alarm indication.
    d. At the completion of operational testing, a burn-in test will occur. The system additions must function without fail for fourteen (14) days. A report shall be created from the system
database to demonstrate the frequency and type of failures that occurred. All failures related to equipment or installation shall be corrected and the burn-in test restarted till it successfully completes the entire duration without failure.

e. Successful completion of the test is a prerequisite to final acceptance of the ACS.
Closed Circuit Television (CCTV) System

1. General Requirements
   a. The CCTV system will utilize a combination of fixed position and pan-tilt-zoom (PTZ) cameras. Fixed position cameras will be used in specific areas that require a dedicated camera (i.e. escalators, security checkpoint lanes, etc.) PTZ cameras will be used to supplement the fixed cameras and provide expanded views of the airport campus. The CCTV system will be programmed to respond to alarm signals from the ACS and automatically display images from a camera viewing a door where the alarm originated. The existing video recording system will be expanded to permit the storage and retrieval of the added cameras installed as part of this project.

2. Camera Coverage and Locations
   a. Typical areas that are monitored by CCTV cameras consist of:
      i. In the vicinity of any secured doors
      ii. Ticketing Lobby
      iii. Passenger Boarding Bridge Doors
      iv. Concourse A and B
      v. A and B Breezeways
      vi. IDF Rooms
      vii. SSCP Lanes and Queue Line
      viii. Escalators/Stairs
      ix. Main Entrance Doors
      x. Administration Reception and Entrance Door
      xi. Outbound Baggage System Chop Doors
      xii. Baggage Claim
      xiii. Baggage Make-Up Area and Tug Drives
      xiv. Ramp/AOA Area
      xv. Garden Area
      xvi. Vehicle Gates controlled by ACS

3. Existing System Description
   a. Manufacturer and Model
      i. The existing CCTV system was installed at the same time as the ACS system by i-Sys Corporation (now Convergint Technologies) in 2010. The system consists of IP-based, megapixel cameras (fixed and pan-tilt-zoom) and a storage attached network (SAN) for storage of recorded video and images. The cameras are manufactured by Pelco, recording software is part of the Andover Continuum system.
   b. System Architecture
      i. Cameras are cabled back to the nearest IDF where they are connected to a power-over-Ethernet (PoE) network switch and video is then distributed across the network.

4. Approved Security Integrator and Allowance
   a. As noted previously, the CCTV system is under an annual service agreement with Convergint Technologies. In order to insure Convergint Technologies is responsible for the furnishing, installation, programming and testing of the CCTV extension required under any project, it is recommended that an allowance figure be established for all CCTV work. This allowance figure will be developed by the design team, compared with a pre-bid estimate prepared by Convergint Technologies and put into the bid as a Security Allowance. The CCTV specifications
will denote Convergint Technologies as the Airport’s “certified security contractor” to be used for the project.

5. Hardware Requirements
   a. Cameras
      i. Indoor Fixed, IP-Based Dome Camera
         1. Up to 3 Megapixel (MPx) Resolution
         2. Up to 30 Images per Second (IPS) at 3 MPx
         3. Autofocus Vari-focal 3 - 9 mm and 9 - 22 mm MPx Lenses
         4. Power over Ethernet (PoE), IEEE 802.3af
         5. Compatible with Pelco and Third-Party Video Systems
         6. ONVIF Profile S and Profile G Conformant
         7. 1/3” progressive scan megapixel CCD
         8. Minimum illumination of 2.0 lux color in 3-megapixel mode.
         9. Resolution:
            a. JPEG: 2,048 x 1,536 / 1,280 x 960 / VGA (640 x 480), up to 15 fps
            b. H.264: 1,280 x 960 / VGA (640 x 480) / QVGA (320 x 240), up to 15 fps
            c. MPEG-4: VGA (640 x 480) / QVGA (320 x 240), up to 15 fps
         10. Independent automatic color-to-black & white switching modes for switchover on light threshold.
         11. Automatic back focus mechanism (ABF) for automatic and remote back focus adjustment.
         13. Full duplex two-way audio feature and be capable of transmitting and receiving the audio stream through the same Ethernet connection as the video.
         14. Camera shall support IPv4 and IPv6 network addressing.
         15. Power source shall be PoE (IEEE 802.3af) 7.6W or 12V DC @ 630mA.
      ii. Indoor Pan-Tilt-Zoom, IP-Based Mini-Dome Camera
         1. 3 Simultaneous Video Streams
            a. Dual MPEG-4 (30 ips)
            b. Scalable MJPEG
         2. Supported Protocols: TCP/IP, UDP/IP (Unicast, Multicast IGMP), UPnP, DNS, DHCP, RTP, NTP
         3. Power over Ethernet (PoE) Compatible
         4. Single Model for Surface Mount and In-Ceiling Applications
         5. Autofocus, High Resolution Integrated Color Camera/Optics Package
         6. 80X Zoom (10X Optical, 8X Digital)
         7. Bidirectional Full-Duplex Audio
      iii. Outdoor Pan-Tilt-Zoom, IP-Based Camera
         1. 130 dB Wide Dynamic Range (WDR)
         2. Advanced Low Light Down to 0.03 LUX on Select Models
         3. Anti-Bloom Technology
         4. 3D Noise Filtering
         5. Up to Full HD 1080p and up to 60 Images per Second (ips)
         6. Power over Ethernet (HPoE and PoE+), 24 VAC, 24 VDC
         7. Pelco H.264 Smart Compression Technology
         8. Electronic Image Stabilization (EIS)
         9. Vandal Resistant IK10 Smoked or Clear Bubble
10. IP66 rated water and dust resistant.
11. Housings shall be equipped with a sunshield and integral heater/blower to accommodate for environmental changes.
12. Housing heaters, blowers and defrosters shall be powered from a dedicated 120VAC power source. Provide low-voltage power supply as required.

b. Mounts and Brackets
   i. Provide required mounts and brackets for the specific installation. Typical mounts consist of:
      1. Pendant Mount
      2. Interior and Exterior Heavy-Duty Wall Mount
      3. Corner Mount Adapter
      4. Pole Mount Adapter
   ii. All cabling shall be run through the mount to the camera and shall be hidden from view.

c. Network Video Recorders/Servers
   i. As cameras are added to the existing CCTV system there may be a need to increase video storage. Provide a network video server(s) to support the recording of all cameras provided under the project. Server storage shall be sized based upon Owner’s current recording and storage requirements. Integrator shall provide calculations based on Owner’s requirements supporting the size and configuration of storage drives.
   ii. Servers shall be installed in Owner’s existing rack located in IDF-2 or as directed by GSP IT.
   iii. CCTV server shall meet the following minimum specifications:
      1. Rack-mountable, provide all required mounts, brackets and supports to install server in an existing equipment rack.
      2. Intel Xeon E5-2600 processor
      3. 26 x 2.5-inch internal disk capacity
      4. Up to 24 DIMMs
      5. PCIe 3.0-enabled expansion slots
      6. Embedded NICs: 1GBE
      7. RAID 5 storage with controller, min.
      8. Hot plug fans and disks
      10. Dual hot-plug redundant power supply

6. System Interfaces and Features
   a. ACS System
      i. The CCTV system shall be integrated with the ACS as specified for this project. The CCTV system shall immediately respond to alarm events associated with the ACS by calling designated camera views near the site of the alarm to designated alarm monitors in the Airport Operations Center (AOC). If the designated view is from a PTZ style camera, the CCTV system shall be capable of selecting a programmed preset position at the direction of the ACS to allow the PTZ to rotate and zoom in on the area of the alarm event or the specific emergency call station. If the area is capable of being viewed from several cameras, the closest view will be called up to the designated alarm monitor with additional images being called up in sequence to a designated alternate alarm monitor.
ii. This integration shall be accomplished through a software data exchange; contact closure interfaces to the ACS shall be prohibited.

iii. The CCTV system shall interface with the NVR such that during alarm events as determined by the ACS, the NVR shall switch into a real-time high-resolution mode and record the images from the primary camera viewing the area associated with the alarm event.

b. Duress Alarms
   i. Activation of any duress alarm will result in calling designated camera views near the site of the duress alarm to designated alarm monitors in the Airport Operations Center (AOC).

c. Automatic Defibrillator (AED)
   i. Activation of any AED cabinet door tamper switch will result in calling designated camera views near the site of the duress alarm to designated alarm monitors in the Airport Operations Center (AOC).

7. Head-End Configuration and Programming
   a. The existing virtual matrix software in place is Andover Cyberstation Viewing software. Cameras and NVR installed under this project shall provide the same functionality currently in place. Any camera shall be capable of being viewed on any monitor or one camera on all monitors without limitations.

   b. The Approved Security Integrator shall provide all required programming, software and graphic map updates required for the extension of the CCTV system. All programming, software updates, database modifications, graphic user maps, etc. shall be provided and installed/programmed by an authorized and certified Tour-Andover, Inc. representative.

8. Network (IP) Connectivity
   a. LAN equipment required for the communication of cameras and NVRs shall be provided by the Owner. Coordinate with GSP IT Department as required for network setup and configuration.

9. Cabling
   a. All wire and cable shall be Underwriter’s Laboratories (UL) listed, and shall meet all national, state and local code requirements for its application.

   b. All wire and cable shall meet individual system or subsystem manufacturer specifications.

   c. All CCTV cabling shall be installed in conduit. Conduit shall be either labeled or color coded (same color as cabling) to specify the conduits use (i.e. CCTV).

   d. Category 6 cable shall meet the requirements defined in the horizontal cabling section of this standard.

   e. Because all security cabling is to be installed in conduit, CMR cable is approved for use.

10. TVSS Protection
    a. TVSS protection is required for any camera that are installed in an exterior environment.

    b. All inputs shall be protected against surges induced on device wiring. Outputs shall be protected against surges induced on control and device wiring installed outdoors and as shown. All communications equipment shall be protected against surges induced on any communications circuit. All cables and conductors, except fiber optics, which serve as communications circuits from the camera to field equipment, and between field equipment, shall have surge protection circuits installed at each end.

11. Testing
    a. The Approved Security Integrator shall submit a Test Plan for Installation and Acceptance Tests for the review and approval of the designer and GSP IT. The test plan for each phase
shall detail the objectives of all tests. The tests shall clearly demonstrate that the system and its components fully comply with the requirements specified herein. Test plans shall contain at a minimum:

i. Test equipment is to be identified by manufacturer and model
ii. Interconnection of test equipment and steps of operation shall be defined
iii. Expected results required to comply with specifications
iv. Record of test results with witness initials or signature and date performed
v. Pass or fail evaluation with comments

b. The CCTV System shall be fully tested and accepted, with test results recorded individual test reports for review and acceptance. All CCTV devices and equipment shall be tested.

c. CCTV cameras shall be fully adjusted and tested to provide optimal video pictures and signals. All camera adjustments and settings available shall be utilized and adjusted. All camera adjustments and settings shall be recorded in individual camera test reports for review and acceptance.
# APPENDIX A – APPROVED MANUFACTURERS

## EQUIPMENT CABINETS AND RACKS

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>MANUFACTURER</th>
<th>PART/MODEL#</th>
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</thead>
<tbody>
<tr>
<td>Open Frame Rack</td>
<td>Ortronics</td>
<td>OR-1984-T2SDB</td>
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<td>Open Frame Rack</td>
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<td>Vertical Wire Manager</td>
<td>Ortronics</td>
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<td>Vertical Wire Manager</td>
<td>Commscope</td>
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<tr>
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<td>Ortronics</td>
<td>OR-GXC422942-A1-B</td>
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<td>Electronic Lock</td>
<td>Digitus-Biometrics</td>
<td>MultiCardLock-HF</td>
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<td>Horizontal Wire Manager</td>
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<tr>
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## PATHWAYS

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<td>STI</td>
<td>EZPATH Series 44</td>
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<td></td>
<td>Hilti</td>
<td>FireStop Speed Sleeve</td>
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<tr>
<td>Cable Runway</td>
<td>CPI-Chatsworth</td>
<td>10250-XXX</td>
</tr>
<tr>
<td>Runway Radius Drop</td>
<td>CPI-Chatsworth</td>
<td>12100-XXX</td>
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<tr>
<td>Cable Tray</td>
<td>CPI-Chatsworth</td>
<td>34821-XXX</td>
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<tr>
<td>Tray Radius Drop</td>
<td>CPI-Chatsworth</td>
<td>34741-XXX</td>
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<tr>
<td>J-Hook</td>
<td>Caddy-Erico</td>
<td>CAT32HP</td>
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## BACKBONE CABLING INFRASTRUCTURE

<table>
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<th>DESCRIPTION</th>
<th>MANUFACTURER</th>
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<tbody>
<tr>
<td>Single-mode Fiber Optic Cable - Interior</td>
<td>Corning</td>
<td>048E88-61131-29</td>
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<tr>
<td>Single-mode Fiber Optic Cable ARMM - Interior</td>
<td>Commscope</td>
<td>7601273-XX</td>
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<tr>
<td>Single-mode Fiber Optic Cable - Exterior</td>
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<td>036EWP-T4101D20</td>
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<tr>
<td>Fabric Innerduct - Interior</td>
<td>Maxcell</td>
<td>MXP3456BK</td>
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<tr>
<td>Fabric Innerduct - Exterior</td>
<td>Maxcell</td>
<td>MXED86383</td>
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<td>Fiber Optic Distribution Unit</td>
<td>Corning</td>
<td>CCH-04U</td>
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<td>Patch Panel Housing</td>
<td>Commscope</td>
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<tr>
<td>Adapter (Housing) Panels</td>
<td>Corning</td>
<td>CCH-CP12-A9</td>
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<tr>
<td>Adapter (Housing) Panels</td>
<td>Commscope</td>
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<tr>
<td>Fiber Optic Pigtailed Splice Cassette</td>
<td>Corning</td>
<td>CCH-CS</td>
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<td>Fiber Optic LC Connectors</td>
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<tr>
<td>Fiber Optic Jumper (Patch Cord)</td>
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<td>Superior-Essex</td>
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<td>Category 3 Backbone Cable - Exterior</td>
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### HORIZONTAL CABLE INFRASTRUCTURE

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<td>Commscope</td>
<td>UN874043014/10</td>
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<tr>
<td>Category 6 Cable – Non-Plenum</td>
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<td>UN884026814/10</td>
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<td>Category 6A Cable - Plenum</td>
<td>Commscope</td>
<td>UN874035114/10</td>
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<tr>
<td>Category 6A Cable – Non-Plenum</td>
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<td>UN884031014/10</td>
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<td>Category 6 Cable - Exterior</td>
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<td>Work Area Outlets</td>
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<tr>
<td>Category 6 Modular Connector</td>
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<tr>
<td>Category 6A Modular Connector</td>
<td>Commscope</td>
<td>76023766-X</td>
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<tr>
<td>Faceplate</td>
<td>Commscope</td>
<td>2111010-X</td>
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<tr>
<td>Wall Phone Faceplate</td>
<td>Commscope</td>
<td>1479152-X</td>
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<tr>
<td>Surface Mount Biscuit Outlet</td>
<td>Commscope</td>
<td>1116698-X</td>
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<td>Category 6/6A Patch Panel</td>
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<td>Category 6 Modular Connector</td>
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<td>Category 6A Modular Connector</td>
<td>Commscope</td>
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<tr>
<td>Category 6 Patch Cord</td>
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### TELECOMMUNICATION GROUNDING SYSTEM

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<td>GBI144XTMGB</td>
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<td>Ground Busbar (Racks and Cabinets)</td>
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<td>2-Hole Ground Lugs</td>
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### PUBLIC ADDRESS SYSTEM

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<tr>
<td>Operating Software</td>
<td>IED-Atlas</td>
<td>GLOBALCOM Vx</td>
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<tr>
<td>Network Integrated Power Amplifier</td>
<td>IED-Atlas</td>
<td>DNA78X4</td>
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<td>Digital Network Amplifier</td>
<td>IED-Atlas</td>
<td>DNA2404CL</td>
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<td>Backup Amplifier/Switcher</td>
<td>IED-Atlas</td>
<td>1544BAS</td>
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<td>Ambient Noise Sensor</td>
<td>IED-Atlas</td>
<td>540S</td>
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<tr>
<td>Full Function Microphone</td>
<td>IED-Atlas</td>
<td>A528HFM-H</td>
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<tr>
<td>Limited Function Microphone</td>
<td>IED-Atlas</td>
<td>A524-H</td>
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<tr>
<td>Audio Input Module</td>
<td>IED-Atlas</td>
<td>1502AI</td>
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<tr>
<td>Logic/Relay Module</td>
<td>IED-Atlas</td>
<td>1522LR</td>
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<td>Alphacom E7</td>
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<td>Sub-Station</td>
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<tr>
<td>Analog Vandal Resistant</td>
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<td>IP Vandal Resistant - Vehicle Gates</td>
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<td>IP Vandal Resistant - Entry Doors</td>
<td>Stentofon</td>
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<td>Back Box</td>
<td>GAI-Tronics</td>
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<td>Pole Mount Kit</td>
<td>GAI-Tronics</td>
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<td>Cellular Interface</td>
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<td>GSM</td>
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<td>Surge Protection-480V</td>
<td>Ditek</td>
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<tr>
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<td>46&quot; LCD Monitor</td>
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<td>Display Device Controller</td>
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<td><strong>Common Use System</strong></td>
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<td>Boarding gate Reader</td>
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<td>Document Prinetr</td>
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<td>Laser Scan Reader</td>
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<td><strong>Access Control System</strong></td>
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<tr>
<td>Delayed Egress Push bar (15 seconds)</td>
<td>Exit Check®</td>
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<td>RK40</td>
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<td>Request-to-Exit Pushbutton</td>
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<td>System Sensor</td>
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<td>Duress Alarm</td>
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<td>Cyberstation</td>
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<td>SWM-CA</td>
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<tr>
<td>Network Video Recorder/Server</td>
<td>Dell</td>
<td>PowerEdge R720XD</td>
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APPENDIX B – LABELING REQUIREMENTS

GSP Structured Cable Labeling Standard

1. General Labeling Requirements
   a. All labels shall be typed, and machine printed on permanent vinyl self-adhesive labels. Handwritten labels are expressly forbidden.
   b. All cables and structures (copper, fiber, and innerduct) shall be labeled identically at both ends of the run prior to job completion.
   c. All cables shall be labeled on the visible portion of the cable within three to six inches of the termination point on both ends.
      i. Cable labels shall be visible by removing wall mounted faceplates in each room.

2. Inter-building and Backbone Cable Labeling
   a. Fiber optic backbone cabling labels shall contain the cable origin room number and the destination room number, the number of fiber strands, and the media type.
      i. Example: IDF13-IDF14-SMF001-48 for the first 48 strand bundle of single mode fiber from IDF13 to IDF14.
   b. Copper backbone cabling labels shall contain the cable origin room number and the destination room number, and the total pair of copper wires.
      i. Example: IDF13-IDF14-CU001-50 for the first 50 pair copper feeder from IDF13 to IDF14.

3. Intra-building Category 6 Cable Labeling
   a. Category 6 cables shall be labeled with the architectural drawing room number the wall plate jack is installed in, the IDF room the patch panel is installed in, the service type (i.e. Voice/Data) the cabling is intended for, and the patch panel and patch panel port number.
      i. Example: TC254—IDF12—D—F11 for the wall outlet cabled to the F11 data patch panel port in IDF12.

4. Equipment Cabinet and Rack Labeling
   a. Cabinets and racks shall be labeled numerically, with a label affixed to the topmost section of the cabinet/rack.
   b. The cabinet nearest to the entry way door shall be cabinet 1 and shall be labeled C1. Additionally, the rack nearest to the entry way door shall be rack 1 and shall be labeled R1. Cabinet labeling example: C1, C2, C3, etc. Rack labeling example: R1, R2, etc.
   c. Multi-sectional colocation cabinets shall be labeled alphabetically to identify each section from top to bottom. Colocation cabinet labeling example: C3a, C3b, C3c.
5. Fiber Patch Panel Labeling
   a. Each fiber patch panel enclosure shall be uniquely and sequentially numerically labeled
      beginning with the first patch panel at the top of the first rack always beginning with 1
      and never repeating a number. Example: F1, F2, etc.
      i. The first rack is always the rack nearest to the entry way door (see section 4
         “Equipment Cabinet and Rack Labeling”).
   b. The manufacture printed alpha-numeric port identifiers on each patch panel shall serve
      as the port identification number/letter. Labels shall not be printed over the
      manufacture printed port numbers.
   c. Fiber patch panel enclosures shall have labeling inside the enclosure door indicating the
      remote location/termination point.

6. Category 6 Patch Panel Labeling
   a. Individual patch panels shall be dedicated to either voice or data and not both.
      i. All wall plate jacks dedicated to ‘data’ use shall terminate on the data patch
         panel. All wall plate jacks dedicated to ‘voice’ use shall terminate on the voice
         patch panel (see Wall plate labeling section 7 for further information).
   b. Each patch panel shall be uniquely and sequentially alphabetically labeled beginning
      with the first patch panel at the top of the first rack always beginning with A and never
      repeating a letter.
      i. The first rack is always the rack nearest to the entry way door (see section 4
         “Equipment Cabinet and Rack Labeling”).
      ii. For every two data patch panels, there shall be one voice patch panel. Example:
           The first patch panel at the top of the rack will be data panel D – A, followed by
           data panel D – B, followed by voice panel V – C.
   c. The manufacture printed port numbers on each patch panel shall serve as the port
      identification number. Labels shall not be printed over the manufacture printed port
      numbers.
      i. Example: There will never be an A49 or A50 wall plate jack number, and D-A1
         will only ever terminate on the first patch panel port on the first patch panel.
7. Wall Plate Labeling
   a. Wall plate jacks shall be labeled indicating the IDF room, service type, patch panel and patch panel port with which the corresponding cable terminates.
   b. The third jack in the wall plate shall always be dedicated to voice service and shall terminate on the voice patch panel. The fourth slot shall be a blank or shall serve as an additional jack dedicated to data service and shall continue counting from data jack two.
      i. Example: