CITY OF HOUSTON

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HOUSTON AIRPORTS

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Supply Chain Management
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April 18, 2024

SUBJECT: **Addendum No. 6**

REFERENCE: Invitation To Bid (ITB) for IAH Terminal D Conveyance Replacement at George Bush Intercontinental Airport (IAH), Solicitation No. HOA-CONREP-2024-015; Project No.1028

To: All Prospective Bidders:

This Addendum is issued for the following reasons:

I. A Site Visit will be held on Tuesday, April 30, 2024, at 1:00 P.M. CT. Attendees will meet prior to departure to the site location in the lobby of the:

IDO Building
111 Standifer Drive
Humble, TX 77338

All individuals attending the site visit must email the mandatory required documents (reference attached) to SPS Ola Alhammami at Ola.alhammami@houstontx.gov by Tuesday, April 23, by NOON.

II. CHANGE the Bid due date from May 02, 2024, to May 23, 2024, at 10:30 A.M. (CT).

III. CHANGE project total for Elevator / Escalator Work from 720 days to 1078 days.

IV. SUPPLEMENTAL RESPONSE TO QUESTIONS IN REFERENCE TO ADDENDUM NO. 4, DATED MARCH 13, 2024.

1. **Question #1:** I noticed that you all are requesting the modernization of this project's three (3) elevators. Would you also accept a rip-out and replacement of these if the elevators can fit?

   Response: The conveyance equipment will be modernized with similar equipment, Re: Elevator Specification 14250.

2. **Question #2**: Does HAS happen to have the as built drawings for the existing escalators, moving walks, and elevators? That would be very helpful to look into what structural modifications need to occur.

   Response: The successful bidder will receive a complete set of existing Terminal D legacy drawings, however, if Bidder needs accessing the Legacy Plans to review background information, then the Contractor is required to submit a Non-disclosure Agreement Form (HAS NDA 2024) to HAS to provide access to information. See attached NDA 2024 Form.

3. **Question #3:** I need clarification on removing the glazing at three terminal points. The glazing will need to be removed and not replaced for the work at that site for 4-6 months due to the lack of laydown room for material and access to dumpsters on AOA. How long can the glazing be removed, and what is the procedure for temporarily covering the openings?

   Response: A permanent material staging, laydown and sweep area will be provided outside the airport's secure area within a one-mile radius to the nearest access gate to Terminal D. This location will be coordinated with HAS. The last sweep for K-9 inspection is 2030 hrs. The sweeps will take place at a location agreed upon with the contractor and airport security. Swept material shall then be placed under the constant control of a badged employee from the time of sweep until 2200 hrs. when it can be moved into the terminal. If the entry point is a window, the glazing may be removed, and a solid barrier (barricade) made of fire-treated plywood or gypsum with locked doors may be placed to allow long-term usage of the access point. Protection from the weather shall be a part of the assembly. If Contractor proposed the use of any other solid barricade material, it will require approval from HAS and Airport Airside Operations Management.

4. **Question #4:** The removed glazing access point will be on the AOA at two points. We need clarification on what the access to the AOA will look like. Will we have unlimited access to the ramps before the access point? Will we be allowed to have dumpsters on the AOA? Will we have 50-foot-long delivery trucks on the AOA and ramps?

   Response: Dumpsters, or dumpster trucks, are only allowed to be placed on the airside by building entry points on a nightly basis from 2200 to 0600 hrs. Still, they are not permitted to be left on the airside after 0600, and any work impacting the airside may only occur during these hours. If debris has to be removed via the airside, it must be hauled off nightly. HAS will work with the Contractor on routing, but please advise on the plan. Dumpster locations will be coordinated with the awarded Contractor at the Pre- Construction Meeting.
   There will be access for 50-foot-long delivery trucks on the AOA and ramps. Access is limited at the entry point and Contractor will need to coordinate with HAS as to the space requirements to accomplish work.

5. **Question #5:** Due to this project mainly consisting of night work, will BSG be doing the inspections, or will this need to be done by a 3rd party inspection company?

Response: Yes, BSG will be doing inspections. The Contractor needs to submit a request to BSG and get approval before starting the work. Material testing will be done by a third-party testing lab contracted by HAS, and the structural engineer-of-record will provide a stamped letter required by BSG for Final Inspection. If required by the Contractor, BSG will conduct after-hours inspections; however, the contractor will require submitting an inspection request 48 hours in advance to BSG to obtain approval for the inspector.

6. **Question #7:** Plans call for temp containment walls of framing and sheetrock due to the lack of space around some sites. We would need to use movable walls as an alternate option to give the site more room to work; what alternate will be approved?

   Response: Movable partitions may be used. A 5-foot clearance to meet OSHA is acceptable; however, the Contractor will notify the HAS Project Manager and Architect of locations needing additional space during construction for review and approval. Refer to revised Sheets A3-03 and A3-04 for modified staging areas.

7. **Question #8:** All material movement activities will be performed at night (10 PM - 6 AM). Please advise if all OTHER work on the project must also be performed between 10 PM and 6 AM. NOTE: the first several weeks of each escalator and moving walk installation will be loud. Still, noise during the remainder of the installation window of each unit will be sporadic, not constant. Performing all work at night will be expensive (Escalator installers are paid double time for all after-hours work) and inefficient – especially considering the long duration of the project overall. However - we do not want to create a situation of constant friction regarding noise throughout the project, as we cannot guarantee what level of noise will be considered disruptive to the owner. Please clarify the work schedule we should anticipate accordingly. This will need more discussion. Performing all work at night will be expensive (elevator installers are paid double time for all afterhours work) and inefficient – especially considering the long duration of the project overall.

   Response: Refer response provided to Question #3. Noisy work is required to be done during night-time between 2200 to 0600 hours. The General Contractor shall include in their bid all cost to perform the work and to perform the noisy work inside the terminal during nighttime. Non-noisy work may be allowed during daytime in properly secured work areas; however, approval from HAS will be required.

8. **Question #10:** What is the maximum number of units that can be removed from service for modernization at any given time? NOTE: This will impact project duration, and workforce availability will limit capabilities.

   We recommend front loading the escalator and elevator work to allow for reducing the total time on site. We recommend the following sequence for HAS consideration. These front loads work of the shorter lead time products, and limits required on site manpower to a level which can be supported:

   Leadtime - AFTER signed contract / approvals / survey / dwnpmt - 30 weeks.
   Phase 1 – Modernize 2 Escalators – Approx 16 weeks.

Modernize 1 Elevator - Approx 6 weeks.
Phase 2 – Modernize 2 Escalators – Approx 16 weeks.
Modernize 1 Elevator – Approx 7 weeks.
Phase 3 – Modernize 2 Escalators – Approx 16 weeks.
Modernize 1 Elevator – Approx 6 weeks.
Phase 3 – Modernize 2 Walks – Approx 24 weeks.
Phase 4 – Modernize 2 Walks – Approx 24 weeks.
Phase 5 – Modernize 2 Walks – Approx 24 weeks.

Project total for Elevator / Escalator Work – 154 weeks (1078 days)

Response: Design team takes no exception to proposed sequencing and extending the overall time duration. However, extending the overall time will require negotiation and approval by HAS.

9. **Question #11:** Escalators: The specifications note that "heavy-duty public transportation escalators are to be provided." Equipment required to meet this load profile should be specified with a rated step load of 264 lbs. per step. This will drive all associated components to meet this "public transportation" standard. This specific step-loading requirement should be added to the specification.

   Response: Provide step loading factor of 265 lbs. to meet Public Transportation type loading conditions. See revised Specification, Section 143100 Escalator Alteration, Paragraph 2.3.A.1.b.

10. **Question #17:** Walks: The requirement for a "truss air conditioner" should be removed from each unit's specification.

    Response: Truss air conditioner is not required for this project. Refer to revised Specification, Section 143200 Moving Walks deleting this requirement.

11. **Question #18:** Walks: The stainless-steel type for the walks should be modified to read "type 304", not 316. 316 is reserved for outdoor or corrosive environments only.

    Response: Provide 304 Type Stainless Steel. Refer to revised Specification, Section 143200 Moving Walks, Paragraph 2.4.C.1.

12. **Question #23:** Walks: Cladding on the exterior of the walk is not provided by the walk manufacturer and should be removed from this specification section (page 14) and added to the work of the General Contractor if required.

    Response: The General Contractor is responsible to coordinate all the work necessary to provide a complete installation. The replacement cladding must be consistent with the existing cladding.

13. **Question #28:** Elevators: ASME 17.1 (2019) Safety Code for elevators and escalators. Can IAH support the 2-way visual communications needs?

Response: The project was designed under provisions of ASME A17.1, 2016 edition; therefore 2-way visual communications is not required. Provide 2-way communication devices per specifications.

14. **Question #30:** Elevators: Delivery / Storage / Staging / and Dumpsters locations need to be confirmed for all units on the drawings. This will be critical to finalizing labor and expenses costs for this project. Please confirm the plan we should anticipate for each unit.

    Response: Please refer to the response provided in Question #4. Additionally, dumpsters may be placed at night near the entry points between the hours of 2200 and 0600, but must be removed each morning before 0600 hrs. A more permanent location would be at loading dock at Terminal C or at other locations coordinated and approved by HAS Airside Operations Management.

15. **Question #35:** Escalators DE13 and DE16 – please confirm that we can anticipate bringing material in at the gate level through a window opening near the top of escalator DE13. NOTE – this is approximately 1300 feet away from DE16. Please also confirm that this temporary opening through the window at the gate level can remain accessible until all old material has been removed and all NEW material has been taken to the barricaded space provided around each unit to be installed. This time frame will ultimately depend on how much space can be provided at each unit to receive and store the NEW material, but it should be anticipated to be an extended amount of time.

    Response: During the Construction period, the contractor may present an alternate Security Plan or modifications to the proposed Security Plan for an additional temporary opening through window; however, it shall be submitted to HAS Security for review and approval 45-days prior to execution.

16. **Question #36:** Escalators DE8 and DE9 deliveries/storage and dumpster locations will be particularly problematic. The only two reasonable delivery locations discussed at the walk-through were at the opposite end of the train tunnel or from the main drop-off lane in front of the terminal, where windows would have to be removed and material lowered from the sidewalk in front of the terminal to the top landing of these units. The option for delivery at the front of the terminal is not addressed in the drawings and would need to be added as an acceptable option for the contractors to price the window removal / etc. If this is allowed, please add it to the contract documents or advise us on the best option we should use. Also, these units' material staging, and dumpster locations must be confirmed, as these will be very important for labor calculations.

    Response: If the entry point is a window, the glazing may be removed, and a solid barrier (barricade) made of fire-treated plywood or gypsum with locked doors may be placed to allow long-term usage of the access point. Protection from the weather shall be a part of the assembly. Use of any other solid barricade material requires approval by HAS and Airport Airside Operations Management, and submission and approval of a revised security plan.

17. **Question #37:** Walks DMSW 4, 6, and 7 – please confirm we can anticipate either bringing material in on Freight Elevator C13 (approximately 1000 feet away) or through the window at the gate level

adjacent to escalator DE13. The window approach would be far more efficient and convenient, but this window would need to be out for an EXTENDED period based upon the installation time frame and the amount of material that would need to be moved for these three walks. Please confirm that storage and dumpsters can also be located adjacent to these locations for these units.

Response: Prior to construction, the contractor will be given the opportunity to explain how security will be maintained and how the equipment will be routed to the location. The Contractor will be permitted to use a lift or crane during work at night only. Access to the Terminal C loading dock, utilizing the C13 freight elevator, is available for deliveries and waste removal. Permission has been granted for three additional locations where glazing can be removed for these tasks. Additional locations may be approved, but the contractor shall coordinate with HAS Security to provide TSA with a 45-day notice to review and approve all ASP Amendments before the project starts. Dumpsters permanent staging is not permitted on the airside, and any work impacting the airside may only occur during limited hours. If debris has to be removed via airside, it must be hauled off nightly. Should a window be removed and not replaced, an alternative barricade to the glazing shall protect the opening from the weather passenger entry or exit the opening. If wood is used, it shall be fire retardant.

18. **Question #38:** Walks DMSW 1, 2, and 3 – please confirm we can anticipate bringing all material in through the window removal location shown in detail two on A2-02. This is approximately 200 feet from the end of walk #3 and approximately 1300 feet from the center of walks 1 and 2. This will be problematic based on the amount of material that will need to be removed and brought in, so please advise if there is a better alternative than what was not discussed at the walk-through.

    Response: Please refer to the response provided in Question #35.

19. **Question #39:** Will flooring protection be required from each unit's designated entry point to the barricades? If so, please specify the material to use and any special considerations to make.

    Response: As means and methods, the awarded Contractor shall review the equipment's weight and the capacity of the transportation equipment to be used to transport equipment, and protect the floor as required with either Masonite floor protection, wood or any other material proposed by the Contractor. The proposed material will require HAS approval. The Contractor is responsible for any damage to the building during the equipment's movement. Floor protection is only required if the Contractor needs it to protect the floor because the means of transport exceeds the floor's capacity to support it without damage.

20. **Question #40:** Please confirm delivery path floor protection can remain in place for as long as needed for each unit. Please keep in mind that many of the delivery paths are extremely long, and that the limited amount of space allowed for installation barricades around each unit will force most material to be in remote storage. Daily removal of this protection is note feasible for these reasons.

    Response: The approved floor protection material will remain in place as long as needed for each unit; however, will provide protection plan and time for HAS to review and approve.

21. **Question #41:** Please advise specifics for dog sweeps of delivered material. Will all boxes and crates need to be opened? Will material be removed from delivery flatbeds before an inspection can occur? We need to be able to plan for the amount of time this will take per delivery (53- 53-footlong flatbed). (Escalators will come on one truck per unit, / Walks will be delivered on approximately three trucks each.)

    Response: Regarding specifics on dog sweeps. Any equipment with concealed compartments must be cleared by k9 sweep before taking into the sterile area. That must be coordinated with HAS Security one business day in advance at the minimum. The Contractor must provide date/time/location/onsite POC for the sweep. The latest time slot that a k9 can be scheduled is 2030. The Contractor will coordinate early with HAS Security to work out logistics for any sweeps not at the dock (window locations). No "clean location" in the secure area will be allowed for permanent staging.
    Refer to response to response to Question #3 in addendum #4 for sweep protocols.

22. **Question #44:** Can electrical ground wires be modernized at the disconnect switch at each unit? If not – a notation should be made for this to be added to each unit by the General Contractor.

    Response: The Contractor will provide unit pricing in Bid Form 00410 for No.8 or No. 10 ground wire per foot and will be required to inspect for existing conditions prior to installation. The Contractor to add ground wire inside existing conduit for each unit.

23. **Question #46:** Notation should be made on the drawings that minor wall/paint repair may be required where the new escalator decking butts up against adjacent wall finishes.

    Response: The General Contractor is responsible for all work to modernize each unit in the scope of the project, and for the protection of adjacent wall and floor surfaces finishes. If these surfaces are damaged by construction operations, the Contractor is responsible for repairing and finishing such surfaces to match the existing adjacent surfaces.

24. **Question #47:** Once the new walk decking has been installed, all exterior cladding on the outside of each walk will need to be removed and replaced. This requirement should be noted in the plans and specifications so that the GC can cover the cost.

    Response: The Contractor is responsible for modernized work in each unit and shall be responsible for adjusting existing conditions to perform and complete the work.

25. **Question #48:** The auxiliary decking between walks 4 and 7 must be modified based on the final location of the NEW DECKING provided for each unit. The new decking will be approximately 2 inches higher off the floor than the existing one. Notations should be added to the drawings for the General Contractor to include this work on their scope. Details of the new final condition should also be added to the contract documents.

Response: General Contractor to provide new decking to match existing. New decking material will be 304 Type stainless Steel.

26. **Question #51:** NOTE—barricades around ALL WALKS will require a minimum of 5'0" clear from the interior wall of the barricade to the nearest obstruction to allow for internal staging of material and to provide an efficient and safe workspace. Drawing notation should be made.

    Response: Refer to revised Sheets A3-03 and A3-04 for modified placement of barricades.

27. **Question #52:** The general contractor should note the removal of windows and the provision of temporary entrance protection and ramps as required on the drawings. Remember that these windows will need to be out for an EXTENDED amount of time due to the amount of material that will need to be moved, and the temporary enclosure will need to be easily removable on a nightly basis.

    Response: Please refer to the response provided in Question #3 and #35.

28. **Question #54:** Headroom clearance at both the upper and lower ends of each escalator and walk will need to be a min of 7'6" clear for the escalators and 8'0" apparent on the walks to provide space for scaffolding and hoisting equipment necessary to demo and install equipment. Any obstruction, such as drop ceilings/lighting/sprinklers/conduit/security cameras / etc., must be removed and relocated to provide room for the installation. A notation should be made on the drawings that the general contractor will perform this work.

    Response: It is the General Contractor's responsibility to complete the work required for the new conveyance systems installation, including temporary removal of existing obstruction to complete the work. General Contractor will remove, and obstructions as needed to complete the work and to replace those items after installation of systems.

29. **Question #55:** Walk #3 MAY have a condition that local AHJ may consider a code violation, which may need to be corrected before turnover for owner usage following the modernization. The wall at the end of the unit infringes upon what the code defines as the required safety zone at the end of the unit. This should be confirmed with the AHJ inspector to verify if modifications to this wall will be necessary. As applicable, notations should be made to the drawings to reflect the scope of work accordingly.

    Response: This area is in an existing condition; the work will not modify any wall locations or change the current clearances.

30. **Question #56:** Assuming the escalator's step loading is noted in the following addendum to be required at 264 lbs. per step, the following will be the 3 phase electrical requirements for each unit. Please verify that this service will be provided to each unit. Controller over-current protection 13.4 HP 10.0kw Full load Running amps 18.0 Power subtly 480v Current rating type RK1 Time Delay fuse 25-30 amps Current ratting inverse time circuit breaker 25-45 amps.

Response:

a. The Contractor will provide unit pricing in Bid Form 00410 for No.8 or No. 10 ground wire per foot and will be required to inspect for exiting conditions prior to installation. Contractor to add ground wire inside existing conduit for each unit.

b. Existing 120 V power is in place at both ends of the escalators and moving walks.

c. ESC 8/9 was designed based on a 20-hp motor with a 50-amp breaker. ESC 13/15/16/17 were created based on a 15-hp motor with a 40-amp breaker. Based on those numbers provided, no additional load will be added, but breaker sizes would need to be adjusted depending on the equipment purchased.

V. RESPONSE TO THE ADDITIONAL QUESTIONS

1. **Question:** An additional concern is related to the project funding referenced in the product specs. Typically, projects of this type of need to meet FTA standards, to which KONE can comply. The latest specification, however, requires compliance with the FHWA. This requires 90-100% of steel to be of US content. From a KONE provided equipment point of view, this is not possible. We would like to know if the bids received are deemed acceptable from a cost point of view, will failure to meet FHWA guidelines derail the entire project?

   Response: Buying goods produced in the United States will meet FTA standards. Refer to revised Specifications 143100 and 143200. FHWA requirements do not apply to this project's scope of work.

2. **Question:** Conveyance Code does not require new sumps and drains for equipment modernization. Please advise if new sumps and drains will be required.

   Response: There are existing sump pumps in some elevator pits. There are some which do not, such as D7 & D8. Also, pumps need to be installed in the lower escalator pits which are capable of retaining fluid s noted in plumbing plans. Pumps can be installed in those pits without cutting a sump into the pit floor/escalator pit. The new pumps, in all pits, should be connected to sanitary drains and work automatically without stopping until the fluid has been removed to a level which the installed pump is capable of removing. Refer to plumbing plans for sump pump locations and details.

3. **Question:** Sheet S2-22 new steel supports for moving walkways. Please confirm existing structure will support new steel supports. Please confirm attachment method is compatible with existing structure.

Response: The new steel is being provided to allow new equipment to work with existing moving walk pit. The weight of new equipment is approximately the same. The pit floor is composite deck, so anchors have been selected to work with that construction type.

4. **Question:** Please provide design for additional data drops to support the new conveyance equipment.

   Response: Data drops are shown on Technology Plans. T1-02, T2-01 and T2-02.

5. **Question:** Original RFI questions #33 - #38 were and attempt to confirm the HAS plan for material delivery and material movement for each unit. This was based upon our understanding of the 3 designated access points as defined on the drawings. As noted previously, we would still request confirmation of these plans. With respect to the 3 designated entry points however, these are adding significant inefficiency and labor cost in some cases due to the proximity to many of the project. As a result - please advise if ADDITIONAL material entry points closer to each work area are possible.
   A. Escalator DE15 – a window path at the gate level near the location of this unit would dramatically simplify material movement to this unit as opposed to the window "Entry Point #1" as currently noted on the drawings. Can we assume we would be allowed to use this path to deliver material on these units?

   B. Escalators DE8/9 – a path from the curb of the Term D entrance / removal of windows / and hoisting down through the gap in the floor between the elevators appears to be the most direct and effect path. Can we assume we would be allowed to use this path to deliver material on these units?

   C. Walks 1 – 3 – is there an alternative location for bringing in material that is closer to the center point between Walks 2 and 3? Entry Point #2 as noted on the drawings is approximately 1300 feet from this center point and will require a significant amount of labor just to move material in an out of the work area.

   Response: The project has identified three access points for material removal and delivery. After awarded the Contract, the General Contractor may submit an alternate option to each work area for review. However, the General Contractor will be required to submit a revised Security Plan to HAS for review and approval.

When issued, the Addendum shall automatically become part of the solicitation documents and supersede any previous specification(s) and provision(s) in conflict with the Addendum. The supplement will be incorporated into the Agreement as applicable. The bidder(s) is responsible for ensuring that all such letter(s) have been obtained. By submitting a bid on this project, bidder(s) shall be deemed to have received all Addenda and incorporated them into their bid.

Addendum No.6
April 18, 2024
IAH Terminal D Conveyance Replacement at George Bush Intercontinental Airport (IAH)
Solicitation No. HOA-CONREP-2024-015
Project No.1028

If you need further clarification regarding this solicitation, please email Ola Alhammami, Senior Procurement Specialist, at ola.alhammami@houstontx.gov.

DS

DocuSigned by:
Cathy Vander Plaats
02232028DE09414...

Cathy Vander Plaats
Aviation Procurement Officer
Houston Airport System

CVP/oa

cc: Alfredo Oracion
Solicitation File

Attachments: Site Visit required documents
Revised 00410B-2
Revised - IT Specs, Division 27
Additional Commissioning Specification Sections
Revised conveyance specifications 143100 and 143200
Drawings-A3-03 and A3-04
E301 - General note to provide unit pricing.
E201-E202-E204-E205-E206 - General Electric Plan

Requirements for temporary CBP secure area access requests.

Requests are to be submitted with *72-hours* advanced notice by the requesting company.

Requests must include:

Individual's Full Name: ***(no nicknames or aliases)***	
Date of Birth:	
Driver's License or State ID #: ***(attach copy)***	
Citizenship and/or Immigration status: ***(copy of resident card, passport or visa) IF APPLICABLE***	
Dates and Time required for CBP access:	
Area(s) of access requested:	
Purpose of access:	
Employer of the individual requesting temporary access: ***(no abbreviations or acronyms)***	
Escort Name, Employer and Badge #: ***(with CBP access)***	
Name of company whose bond will be responsible for the visit: ***(this serves as an authorization)***	

Revised

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
17	143200	Modernize Moving Walk DMSW-7	LF	170		
18	142500	Modernize Freight Elevator D7	EA	1		
19	142500	Modernize Passenger Elevator D1	EA	1		
20	142500	Modernize Passenger Elevator D8	EA	1		
21	270500	Technology Modifications	LS	15		
22	260200	Electrical Modifications, exclude grounding	LS	15		
23	S1-01 S1-02	Miscellaneous Structural Modifications	LS	1		
24	P3.01	Sump Pump	EA	3		
25	A3-04	Equipment and Material Entry into the secure portion of the Terminal. Includes removal and reinstallation of two window panels.	EA	2		
27	01505	Temporary Facilities	LS	1		
28	01145	Mobilization	LS	1		
29	E305 E306	Provide No. 8 ground wire for each conveyance system. Reuse existing conduit.	LF	1,000		
30	E305 E306	Provide No. 10 ground wire for each conveyance system. Reuse existing conduit.	LF	6,000		
TOTAL BASE UNIT PRICES						$_____

SECTION 27 05 09 **Revised**

CONTRACT QUALITY CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contract quality control including workmanship, manufacturer's instructions, mock-ups and demonstrations.

1.2 QUALITY CONTROL PROGRAM

A. Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, site conditions and workmanship to produce work in accordance with contract documents.

1.3 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking. Under no conditions shall material or equipment be suspended from structural bridging.

D. Provide finishes to match approved samples; all exposed finishes shall be approved by the Architect / Engineer. Submit color samples as required.

1.4 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence.

B. Should instruction conflict with Contract Documents, request clarification from Architect / Engineer before proceeding.

1.5 MANUFACTURER'S CERTIFICATES

A. When required in individual Specification Sections, submit manufacturer's certificate in duplicate, certifying that products meet or exceed specified requirements.

1.6 MANUFACTURER'S FIELD SERVICES

A. When required in individual Specification Sections, manufacturer shall provide a manufacturer's qualified personnel to observe:
   1. Field conditions.
   2. Condition of installation.
   3. Quality of workmanship.
   4. Start-up of equipment.
   5. Testing and adjusting of equipment.

B. Manufacturer's qualified personnel shall make written report of observations and recommendations to Architect/Engineer.

1.7 MOCK UPS

A. Assemble and erect the specified equipment and products complete, with specified anchorage and support devices, seals and finishes.

B. Do not proceed with any work involving a mock-up, until the related mock up has been approved in writing.

C. Acceptable mock-ups in place shall be retained in the completed work where possible.

D. Perform tests and submit results as specified.

1.8 SCHEDULING OF MOCK-UPS

A. Schedule demonstration and observation of mock-ups, in phases, with Architect / Engineer.
   1. Rough-in
   2. Finish with all appurtenances in place
   3. Demonstrations

PART 2 - PRODUCTS

2.1 REFERENCE APPLICABLE SPECIFICATION SECTIONS.

PART 3 - EXECUTION

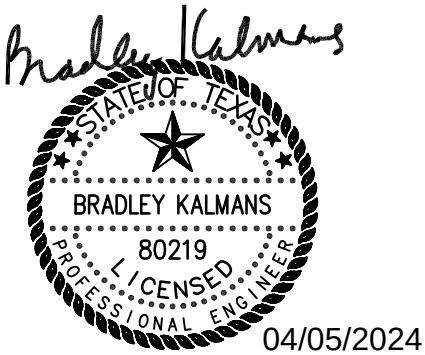
3.1 ADJUSTMENTS AND MODIFICATIONS

A. Contractor shall provide all adjustments and modifications as requested by the manufacturer's qualified personnel at no additional cost to Owner.

3.2 MOCK-UPS

A. Mock-up a typical classroom, science lab of each type, and computer lab with all wiring devices, cover plates, rough-in boxes, conduits, etc. Provide all conductors from all wiring devices to above ceiling space to demonstrate conduit routing and conductor fill.

END OF SECTION



04/05/2024

SECTION 27 05 53

IDENTIFICATION AND LABELING OF COMMUNICATION INFRASTRUCTURE (REV. 09-28-2023-SJS)

PART 1 INTRODUCTION

1.1. General

A. As the Houston Airport System (HAS) continues to develop both its private and commercial interests, it is essential that an effective telecommunications infrastructure be developed and maintained to ensure the support of any and all services which rely on the electronic transport of information. To effectively administer these assets requires a disciplined effort that begins with a systematic practice and procedure for capturing useful data regarding inventories that might be conducted at any point during the lifecycle of a project.

1.2. Objective

A. The objective and intent of this standard is to provide uniform GIS inventory and documentation practices/guidelines for any person or party directly involved with data collection, administration and/or accountability of the HAS IT telecommunications infrastructure or related systems.

1.3. Intended Use

A. Any designer, consultant or engineering entity contracting with the Houston Airport System to inventory/document the telecommunications physical and network configurations will need to re- fer to this document for clarification regarding standard operating procedures. The guidelines given here provide for effective documentation of the HAS telecommunications network. The result of following this standard will be a telecommunications infrastructure that is well documented and easily managed by the administrator.

Note: For specific criteria concerning GIS/GPS datum, refer to the OASIS Standards document maintained by direction under the HAS Planning Design and Construction department. Said datum is not specific to the Information Technology department and thus will not be replicated here.

1.4. Life of the Standard

A. This standard is a living document. The criteria contained in this standard are subject to revision without notice, as warranted by advances in administration techniques related to telecommunications technology.

B. This manual is the property of the Houston Airport System. The contents of this manual are proprietary and should not be copied or disclosed without prior written permission of the Houston Airport System. Any variation from the standards in this manual should be addressed by the Houston Airport System IT GIS contact listed below for approval prior to implementation on a project.

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PART 2 GENERAL

2.1 Scope

A. This standard specifies the GIS inventory and documentation requirements for the Houston Airport System IT Telecommunications Infrastructure, Network Engineer and associated information databases. Areas of the infrastructure and/or databases to be inventoried, administered, monitored or maintained include:

1. terminations for the telecommunications media located in work areas, telecommunications closets, equipment rooms, and entrance facilities;
2. equipment/devices hosting physical terminations;
3. telecommunications media (cable) between terminations;
4. pathways (spans) between terminations that contain the media;
5. spaces (structures) where terminations are located;
6. bonding/grounding as it applies to telecommunications;
7. geophysical plant networks i.e., manhole, handhole, pullbox, cabinet,

pedestal, building access points;

8. splice enclosures.

NOTE: Whereas this document provides an outline and overview of the GIS documentation process, the following Telecommunications Infrastructure Specifications for the Houston Airport System should be referenced for detailed administrative requirements:

B. This standard also specifies requirements for the collection, organization, and presentation of as- built data.

C. In addition to providing requirements and guidelines for a traditional paper-based documentation system, this standard will serve as the reference for all associated computer-based administration tools.

Contracting parties, by this standard, are required to attend an HAS-IT coordination meeting prior to commencement of any documentation effort; the scope of work and project expectations will be dis- cussed at length. You will be given additional direction as required and any useful maps, diagrams, numerical sequences, etc. will be provided to you at this time.

2.2 REFERENCES

The latest published version at the date of contract applies to all references. Related Documents include all Drawings and General Provisions of the Contract. In Conflict between contract documents, the most stringent will be applied.

Related Specifications: Use these Specifications for all related work not specifically covered in this speci- fication.

1. Section 270526: Telecommunication Grounding and Bonding
2. Section 270528: Interior Communication Pathways
3. Section 270543: Exterior Communication Pathways
4. Section 270553: Identification and Labeling of Communication Infrastructure
5. Section 271100: Communication Cabinets and Equipment Rooms
6. Section 271300: Backbone and Riser Media Infrastructure
7. Section 271500: Horizontal Media Infrastructure
8. Section 272100: Data Communication Network Equipment
9. Section 272200: PC, Laptop, Servers and Equipment
10. Section 275113: Audio Communication System
11. Section 281300: Access Control System
12. Section 232313: Video Surveillance Control and Management System

PART 4 DEFINITIONS

4.1 General

4.2 This section contains definitions of terms, acronyms, abbreviations, and formats that have special technical meaning or that are unique to the technical content of this standard.

4.3 Definitions
For the purposes of this standard, the following definitions apply:

A. Assignment
A unique designation assigned to a person who is expected to use the circuit, equipment, service, etc., serving a particular work area. Examples of an assignment: telephone number, a name, a circuit number or a logical address.

B. backbone
Network of copper and fiber connections between termination panels/switches.

C. cable
An assembly of one or more copper conductors or optical fibers within an enveloping
sheath, constructed so as to permit use of the conductors singly or in groups.

D. campus
The buildings and grounds have legal contiguous interconnection. (TIA)

E. equipment
Generally, an endpoint for cable lengths; any hardware device/component. Used to terminate cable for cross-connection or interconnection to other cables or devices.

F. grounding electrode conductor
The conductor used to connect the grounding electrode to the equipment grounding conductor and/or to the grounded conductor of the circuit at the service equipment or at the source of a separately derived system.

G. andhole (HH)
A structure similar to a small maintenance hole in which cable can be pulled, but not large enough for a person to fully enter to perform work.

H. dentifier
An item of information that links a specific element of the telecommunications infrastructure with its corresponding record. (TIA)

I. linkage
A connection between a record and an identifier or between records.(TIA)

J. location
A position occupied or available for occupancy within a site or infrastructure network.

K. manhole (MH)
A vault located in the ground or earth as part of an underground duct system and used to facilitate placing, establishing connections and maintenance of cables as well as placing associated equip- ment, in which it is expected that a person will enter to perform work. (TIA).

L. outlet box (telecommunications)
A metallic or nonmetallic box mounted within a floor, wall or ceiling and used to hold telecommunications outlet/connectors or transition device. (TIA)

M. outlet / connector (telecommunications)
A connecting device in the work area on which horizontal cable or outlet cables terminates. (TIA)

N. pathways
A raceway, conduit, sleeve, or exposed location, for the placing of telecommunications cable that links telecommunications spaces together.

O. record
The permanent documentation of installed telecommunications infrastructure obtained from as- builts.

P. record drawing (as-built)

The documentation of measurements, location, and quantities of material work performed. May be in the form of marked up documents or other work order forms.

Q. report
A presentation of a collection of information from various records.

IDENTIFICATION AND LABELING OF COMMUNICATION INSTRUCTIONS

R. site
Spatial location of an actual or planned structure or set of structures.

S. Span
A raceway, conduit, sleeve, or exposed location, for the placing of telecommunications cable that links telecommunications spaces together.

T. splice
A joining of conductors meant to be permanent. (TIA)

U. splice box
A box, located in a pathway run, intended to house a cable splice.(TIA)

V. splice enclosure
A device used to protect a cable or wire splice.(TIA)

W. structure
Generally an endpoint for span lengths; i.e., manhole, handhole, cabinet, junction box, pedestal, building access point, communications rooms, work areas.

X. structure unit
A component of the structure; usually housing equipment i.e., cabinet, rack.

Y. telecommunications
Any transmission, emission, or reception of signs, signals, writings, images, and sounds; that is, information of any nature by cable, radio, optical or other electromagnetic systems. (TIA)

Z. elecommunications infrastructure
The components (telecommunications spaces, cable pathways, grounding, wiring and termination hardware) that together provide the basic support for the distribution of all telecommunications information.

AA. telecommunications media
Wire, cable, or conductor used for telecommunications.

BB. telecommunications space
Areas used for the installation and termination of telecommunications

equipment and cable, e.g., telecommunications closets, work areas, false ceilings, and manholes/handholes.

CC. termination position
A discrete element of termination hardware where telecommunications conductors are terminated.

DD. work area; work station
A building space where the occupants interact with telecommunications equipment.(TIA)

PART 5 DOCUMENTATION CONCEPTS - GENERAL

A. This section describes the concepts of identifiers, records, linkages among records, and presenta- tion of information necessary to administer infrastructure cable, spans and structures.

5.1 Identifiers

A. An identifier is assigned to an element of the telecommunications infrastructure to link it to its cor- responding record. Identifiers shall be marked at the elements to be administered.

B. Identifiers used to access record sets of the same type shall be unique. For example, each identifi- er for each one of the set of cable records shall be unique. Unique identifiers across all types of telecom- munications records are mandatory. For example, no cable record identifier should be identical to any pathway record identifier.

C. Labeling is the marking of an element of the telecommunications infrastructure with an identifier and (optionally) other relevant information. Labeling shall be accomplished in either of two ways: separate labels may be securely affixed to the element to be administered, or the element itself may be marked.

5.2 Records

A. A record is a collection of information about or related to a specific element of the telecommunica- tions infrastructure.

B. Elements identified as required information and required linkages shall constitute the minimum re- quirements for these records. Specific information and other

linkages suggest additional elements that may be useful to the administrative system, such as cable length.

C. Telecommunications records are typically used in conjunction with other records. For example, a user record or assignment may contain an identifier to the record of the cable that serves an individual's workspace. Conversely, a cable record may also contain an identifier for a user record or assignment.

D. By this standard, the Houston Airport System utilizes AutoCAD and ArcGIS as the software plat- forms by which all telecommunications infrastructure records and linkages are recorded and maintained.

5.3 Relationships

A. Relationships are the logical connections between identifiers and records. The records for infra- structure elements shall be interlinked. For example, in a cable record, termination port identifiers point to specific termination port records that contain additional information about each of the cable termination ports.

5.4 Assignment

5.5. An "assignment" is a specific term of reference that allows the association of the end location, cable pairing record or termination port record with additional information. For example, an assignment such as a telephone number or circuit number can associate a user with elements of the telecommunications in- frastructure. This aids in troubleshooting by identifying both the physical and logical connectivity from a single circuit assignment.

5.6 Presentation of Information

A. A typical documentation system includes labels, records, reports, drawings, and work orders. Re- ports compile and present information found in the records. Graphical information regarding the relation- ship of the telecommunications infrastructure to other infrastructures within the campus or site is present- ed in drawing format. Work orders document the operations needed to implement changes affecting the telecommunications infrastructure.

B. Reports present information selected from the various telecommunications infrastructure records. Reports may be generated from a single set of records or from several sets of interlinked records.

C. Drawings are used to illustrate different stages of telecommunications

infrastructure planning and development. Generally, conceptual and installation drawings supply input to the record drawings that graphically document the telecommunications infrastructure. These record drawings as well as some equipment schedules and installation drawings (i.e., rack layouts) become part of the administration sys- tem documentation.

D. Conceptual drawings (i.e., one-line or riser diagrams) are used to illustrate the proposed design intent. They do not typically include all telecommunications infrastructure elements or identifiers and do not necessarily become part of the administration documentation.

E. Installation or bid drawings are used to document (graphically) the telecommunications infrastruc- ture to be installed. They should illustrate relevant infrastructure elements and may also describe the means of installation. Identifiers may or may not be included on the drawings.

F. Record drawings (as-builts) graphically document the installed telecommunications infrastructure through floor plans, elevation, and detail drawings. These drawings may differ from installation drawings because of changes and specific site conditions. Key elements of the telecommunications infrastructure shall have identifiers assigned. The span/structure and wiring portions of the infrastructure each may have separate drawings if warranted by the complexity of the installation or the scale of the drawings.

G. ESRI (ArcGIS) formatted feature class and feature class layers graphically depict data in a spatial environment and are linked via physical relationship protocols established by the administrator through the utilization of software engineered towards GIS applications.

5.7 Work Orders (Symantec)

A. Work orders document the actions needed to implement changes affecting the telecommunications infrastructure as it was actually installed. The changes may involve several telecommunications compo- nents as well as other related systems. The Documentation Team utilizes Symantec software as its change-management notification platform. Typical Symantec tickets document actions such as moving patch cord, installing a conduit, cross-connect or relocating an outlet box. A Symantec ticket may involve structures, spans, cable, splices, terminations, or grounding, either individually or in combination. A Sy- mantec ticket should list both the personnel responsible for the physical action and those responsible for updating various portions of the documentation to assure its accuracy. *Prior to*

commencement of an ac- tion that would result in a change to any telecommunications infrastructure component or related system; a Symantec ticket should be submitted in accordance with departmental and operational requirements.

5.8 Summary

A. This section has presented basic concepts of documentation for the Houston Airport System Tele- communications Infrastructure. The sections that follow specify the administration of each of the compo- nents of the infrastructure in greater detail.

PART 6 HAS IT INFRASTRUCTURE
STANDARDS FOR DOCUMENTATION

6.1 Data Collection and Administration Concepts

A. This section describes the documentation of assets within the administrative jurisdiction of the Houston Airport System - Public Safety and Information Technology department. As changes are made to the assets, affected labels, records, reports and drawings shall be updated or revised.

The following outline assumes that the contracting parties understand the GIS/GPS datum specifications and requirements as provided in the OASIS standards. Further, that the equipment to be used towards gathering the data has been configured accordingly.

6.2 STRUCTURES

B. Manhole
C. Handhole
D. Pullbox
E. Cabinet (Pole Mounted, Pedestal)
F. Building Access
G. Dog House
H. Remote Location
I. Entrance Facility
J. Workspace
K. Main Distribution Frame (MDF)
L. Building Distribution Frame (BDF)
M. Intermediate Distribution Frame (IDF)

N. Point of Presence (POP)
O. Pathway Transition
P. Aerial Pole

Identification

Each Structure has been assigned a unique GIS database identifier. This identifier serves as a primary-key for each database record. Each record contains additional fields and values relative to the feature identified by the primary-key.

All structure identifiers follow a specific schema; new structures must be identified accordingly. In the event that a determination cannot be made regarding the identification of a structure, please contact an HAS IT GIS representative prior to documenting.

All structures are identified through a numerical range with prefix characters specific to a respective airport campus, technology asset designation, and feature-category.

Airport Campus Characters:

IAH:	I
HOU:	H
EFD:	E

Asset Designation Character:

Technology:	T

Feature-Category Characters:

Structure:	S
Pathway:	P
Equipment:	E
Cable:	C

Numerical Range:

0000 – 9999

Example:

ITS0054 (IAH Structure), HTS0054 (HOU Structure), ETS0054 (EFD Structure)
Manhole Numerical Range:

Note: When planning to identify newly constructed or newly placed HAS assets, the contractor is expected to coordinate with the HAS IT GIS staff prior to labeling. This action will account for all identifiers previously assigned and prevent duplications or omissions.

Labeling

Labeling should follow the identification schema and further be accomplished via an approved method described below.

Newly constructed structures (manhole, handhole, pullbox, cabinet) will require that their identifiers be etched onto the lid or affixed with an appropriate label material. Manholes and handholes should be stamped on the lid itself, as well as the metal ring/material surrounding the opening; or the con- crete foundation (topside). Utilize an appropriate chisel or stamp, or labeling device to accomplish the task.

The Technology Infrastructure group does not maintain the specification for labeling newly con- structed structures (dog house, remote location, entrance facility, workspace, MDF, BDF, IDF, POP, Pole). These should be placarded according to current HAS Infrastructure specification. The Technology Infrastructure GIS identifiers (described in the previous paragraphs) relevant to these spaces and locations are preserved for GIS database record keeping purposes only. Contact an HAS Infrastructure representative for clarification on physical labels for architectural spaces.

Required Fields

Each structure requires that specific data be collected per unit. GPS equipment should be formatted to account for this information:

TELECOM_I

D COORD_X

COORD_Y

COORD_Z

AIRPORT

AGENCY

LID_TYPE

DEPTH_INC

H

SPLICE_CLO

SURE

SLACK_LOO

P

GROUNDIN

G

COMMENTS

BUILDING_

NAME

LEGACY_ID

STRUCTURE_TYPE

STRUCTURE_SU
BTYPE
HAS_LEVEL

LID_SI

ZE

PROJE

CT

COLLECTION

_DATE

LID_SHAPE

LID_MATER

IAL

PROJECT_C

LASS

GPS

Each manhole should be recorded as follows:

Single shots; taken on-center. Offset shots are acceptable for manholes not available to satellite cover- age but these shots must be coordinated with an HAS-IT GIS contact prior to.

Supporting Documentation Deliverables

Additional documentation records are required to support GPS data. The documentation is as follows:

A. Manholes and Handholes only

Digital photos – top (north to top of photo), north wall, west wall, south wall, east wall; for man- holes not true to cardinal compass points adjust call-outs as necessary.

AutoCAD – butterfly diagram of manhole depicting pathway orientation, conduit layout, innerduct configurations, cabling locations, and cabling counts for each manhole unit in both .dwg 2010 or higher and .pdf formats; (See manhole AutoCAD butterfly exhibit; see also the OASIS standards for IT specific AutoCAD layering).

Video – 360 degree imagery of interior; .mpg format.

B. Communication Rooms

AutoCAD – floorplan (where applicable) layouts of structure units depicting orientation, and/or configurations in both .dwg 2010 or higher and .pdf formats; (See AutoCAD communications room exhibit).

Spatial Data Deliverables

The entire manhole inventory should be delivered separately in ArcGIS feature class (version 10) format along with any records outlined in the *'Supporting Documentation"* paragraph. This feature class (STRUCTURE) should contain the attribute values from the 'Required Fields' paragraph.

Special Instructions

None

6.2.4 Cabinets/Racks

Identification

Each cabinet/rack has been assigned a unique campus identifier. All structure identifiers follow some specific schema; new structures must be identified accordingly. In the event that a determination can not be made regarding the identity of the structure, please contact the HAS IT GIS representative prior to documenting.

All cabinets are identified through a numerical range specific to its respective campus and should be pre- fixed with 'PC' (pedestal cabinet) or 'PM' (pole mounted cabinet). The ranges are as follows:

Example:

ITS0054.02.01

Translation: Cabinet or Rack in Room (Structure) ITS0054, row 02, column or position 01.

ITS0054.BB01

Translation: Backboard (plywood) 01 in Room (Structure) S103.1.

Note: Backboards tend to be randomly arranged within the structure and are usually not numbered according to wall orientation. Different identifiers are however assigned to each. Any one backboard could host a wide assortment of equipment; see EQUIPMENT for identifier schemas.

Note: Future expansion of rows should be a major consideration during identifier/labeling phase; numbering from low to high in the direction of any available space.

Labeling

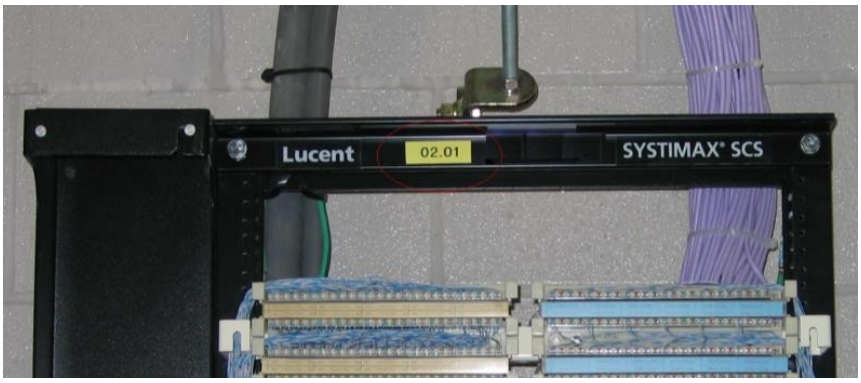
Labeling should follow the identification schema and further be accomplished via the use of below speci- fied labeling device or approved equivalent:

DYMO RhinoPRO 5000 Industrial Label Maker

¾" Flexible Industrial Strength Nylon label tape - yellow

Labels should be affixed to the cabinet housing.

Labels should be affixed to top-center of identified structure unit. For labeling purposes only, the structure identifier can be omitted from the structure unit identifier to minimize space required for the label. It will be assumed that all structure units located in the same structure will carry the same structure identifier. *Note: this is for labeling purposes only; data collection records/tables must use complete identifier including tel- ecom structure identifier.*



Required Fields

No Action required

GPS

No Action required

Supporting Documentation Deliverables

AutoCAD – floorplan and rackface layouts of structure units depicting orientation, and/or configurations in both .dwg 2010 or higher and .pdf formats; (See AutoCAD communications room exhibit).

Spatial Data

Deliverables No Action

required *Special*

Instructions

Structure units are visibly marked with a reference tag identifying its column and row. The telecom struc- ture (ITS, HTS, ETS) is omitted from the reference tag but should be included in the structure unit tables. Newly placed structure units will require that their identifiers be affixed to the cabinet face or rack frame. Utilize specified labeling device to accomplish the task.

PATHWAYS

C. Ductbank
D. Trench
E. Direct Buried
F. Cable Tray

Identification

Each Pathway has been assigned a unique GIS database identifier. This identifier serves as a primary- key for each database record. Each record contains additional fields and values relative to the feature identified by the primary-key.

All pathway identifiers follow a specific schema; new pathways must be identified accordingly. In the event that a determination cannot be made regarding the identification of a pathway, please contact an HAS IT GIS representative prior to documenting.

All pathways are identified through a numerical range with prefix characters specific to a respective air- port campus, technology asset designation, and feature-category.

Airport Campus Characters:

IAH:	I
HOU:	H
EFD:	E

Asset Designation Character:

Technology:	T

Feature-Category Characters:

Structure: S
Pathway: P
Equipment: E
Cable: C

Numerical Range:

0000 – 9999

Example:

ITP0054 (IAH Pathway), HTP0054 (HOU Pathway), ETP0054 (EFD Pathway)

Labeling

Pathways are identified for the purposes of GIS referencing and are linked to structure inventories but are not physically labeled per current guidelines.

Required Fields

Each pathway requires that specific data be collected per unit. GPS equipment should be formatted to account for this information.

CONDUIT

_SIZE

COMMEN

TS

AIRPORT

HAS_ENCASE

MENT

AGENCY

CONDUIT_QT

Y PATH_ID

PATH_NUMB

ER

PATH_TYPE

END1_COOR

D_X

END1_COOR

D_Y

END1_COOR

D_Z

END2_COOR

D_X

END2_COOR

D_Y

END2_COOR

D_Z

HAS_LEVEL

COLLECTION

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_DATE

PROJECT

TICKET

LEGAC

Y_ID

PATHWAY_M

ATERIAL

FROM_TELEC

OM_ID

TO_TELECOM_

ID

TELECOM_ID

PROJECT_CLA

SS

DEPTH_END1

DEPTH_END2

GPS

Each pathway must be recorded as follows:

Care should be taken to accurately locate the pathways prior to commencing with documentation.

Continuous-line shots; taken on center. Line-shots should begin and end on-center of endpoint

(structure) locations.

Supporting Documentation Deliverables

No action required

Spatial Data Deliverables

The entire pathway inventory should be delivered separately in ArcGIS feature class (version 10.x) format along with any records outlined in the *'Supporting Documentation'* paragraph. This feature class (PATHWAY) should contain the attribute values from the '*Required Fields'* paragraph.

Special Instructions

No action required

A. Cable Tray

Identification no requirements per current guidelines

Required Fields no requirements per current guidelines

GPS no requirements per current guidelines

Supporting Documentation Deliverables no requirements per current guidelines

Spatial Data Deliverables no requirements per current guidelines

Special Instructions no requirements per current guidelines

PATHWAY UNITS

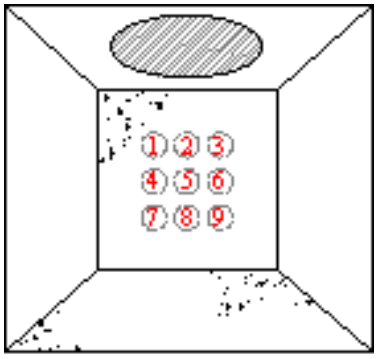
B. Conduits

Identification

For deliverable purposes conduits are only being depicted via AutoCAD formats; i.e. butterfly diagrams or floorplans (see Exhibits: Communication Room Exhibit, Rackface Exhibit)

In the outside plant environment, conduits should be identified where applicable by size, location and po- sition respective to their endpoints (structures) i.e. handhole wall, building access point, etc.

Further, on manhole / handhole butterfly diagrams, OSP conduits are depicted relevant to their size, posi- tion and orientation. As a general rule, conduits are identified left-to-right and top-to-bottom as you're fac- ing the wall to be inventoried and should be prefixed with 'CD' on the AutoCAD documents.



MANHOLE

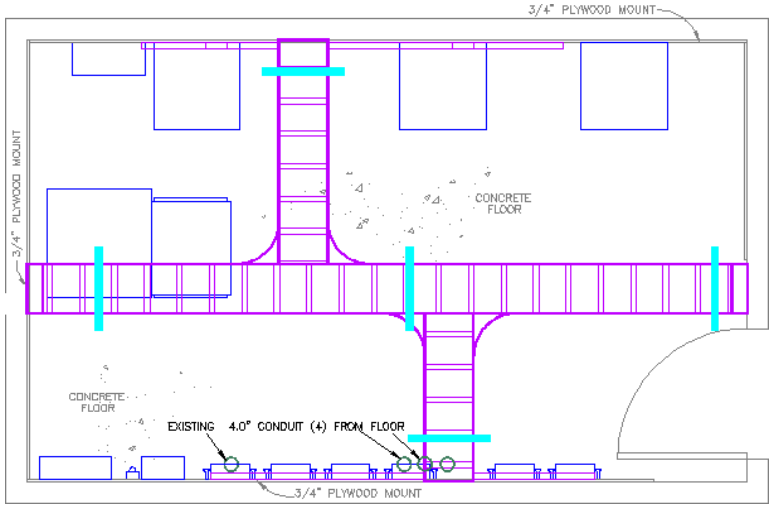
For the purposes of illustration and to be included as part of the manhole butterfly diagram draft docu- ment, each wall should identify the following:

Ductbank (Telecom Pathway Identifier for each respective manhole / handhole wall face) Conduits (Count, Orientation)
Cabling (Telecom Cable Identifier, Cable Type, Cable Count, location within respective conduit)

In the inside plant environment, conduits should be identified where applicable by position and location respective to their endpoints (telecom structures) i.e. communications rooms, vaults

ISP conduits are depicted on communication-room AutoCAD layouts as to their position and orientation; and are not numbered.

Example:



Labeling

Not physically labeled per current guidelines.

Required Fields

Conduit counts, and size as prescribed in the pathway sub-topic

GPS

No action required

Supporting Documentation Deliverables

AutoCAD manhole / handhole butterfly diagrams for OSP conduits and communication-room layouts for ISP conduits; (See manhole / handhole AutoCAD butterfly exhibit).).

Spatial Data Deliverables

No action required

Special Instructions

See note regarding annotation above.

CABLE

A. Inside Plant Copper
B. Inside Plant Fiber (Single-Mode, Multi-Mode)
C. Outside Plant Copper
D. Outside Plant Fiber (Single-Mode, Multi-Mode)
E. Inside Plant Copper Coax
F. Outside Plant Copper Coax
G. Inside Plant Hybrid
H. Outside Plant Hybrid

Identification

Each Cable has been assigned a unique GIS database identifier. This identifier serves as a primary-key for each database record. Each record contains additional fields and values relative to the feature identi- fied by the primary-key.

All cable identifiers follow a specific schema; new cable must be identified accordingly. In the event that a determination cannot be made regarding the identification of a cable-run, please contact an HAS IT GIS representative prior to documenting.

All cables are identified through a numerical range with prefix characters specific to a respective airport campus, technology asset designation, and feature-category.

Airport Campus Characters:

IAH: I
HOU: H
EFD: E

Asset Designation Character:

Technology: T

Feature-Category Characters:

Structure: S
Pathway: P
Equipment: E
Cable: C

Numerical Range:

0000 – 9999

Example:

ITC0054 (IAH Cable), HTC0054 (HOU Cable), ETC0054 (EFD Cable)

Note: When planning to identify newly constructed or newly placed HAS assets, the contractor is expected to coordinate with the HAS IT GIS staff prior to labeling. This action will account for all identifiers previously assigned and prevent duplications or omissions.

Labeling

Labels should be affixed to all connection ends of identified cable and on any visible length at key access points, i.e. manhole, handhole cable ladder runs.

"All adhesive inside/outside plant cable labels for horizontal and backbone cables shall be covered with clear heat shrink tubing"

Required Fields

Each cable requires that specific data be collected per unit. GPS equipment should be formatted to ac- count for this information.

TELECO

M_ID

LEGACY

_ID

AIRPORT

AGENCY

CABLE_

TYPE

CABLE_COUNT

FROM_TELECOM_ID

TO_TELECOM_ID

FROM_STRUCTURE_

UNIT_ID

TO_STRUCTURE_UN

IT_ID

FROM_EQUIPMENT_

ID

TO_EQUIPMENT_ID

HAS_LEVEL

PROJECT

PROJECT_CL

ASS

COLLECTION

_DATE

SYMANTEC_

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TICKET

COMMENTS

GPS

Each cable should be recorded as follows:

OSP – continuous GPS shot between identified structures

ISP – conventional GPS services are unavailable inside-plant; therefore inside-plant cabling will need to be digitized and included in the ArcGIS CABLE feature class spatial data deliverable.

Supporting Documentation Deliverables

ISP Horizontal cabling (see Exhibits – iPatch SOP.pdf).

Cable testing records; .pdf format (see Exhibits – C_Cable Test Exhibit, F_Cable Test

Exhibit.pdf). Butterfly diagrams (OSP) AutoCAD format; (See AutoCAD manhole /

handhole butterfly exhibit). *Spatial Data Deliverables*

The entire OSP cable inventory should be delivered separately in ArcGIS feature class (version 10.x) format along with any records outlined in the *'Supporting Documentation'* paragraph. This feature class (CABLE) should contain the attribute values from the '*Required Fields'* paragraph.

No Spatial Data required for ISP inventory.

Special Instructions

No cable testing should be conducted on any live circuit. Ensure that necessary precautions are ob- served to guarantee existing network integrity and no active circuits are impacted.

I. Jumper Cables / Patch Cords / Cross-Connects:

Identification

No action required

Labeling

No action required

Required Fields

Refer to iPatch SOP (see Exhibits - iPatch SOP.pdf)

GPS

No action required

Supporting Documentation Deliverables

ISP cabling (see Exhibits - iPatch SOP.pdf)

Spatial Data Deliverables

No action required

Special Instructions

No cable testing should be conducted on any live circuit. Ensure that necessary precautions are ob- served to guarantee existing network integrity and no active circuits are impacted.

As iPatch is the administration application for these assets - all project managers, inspectors and consult- ants overseeing ‘new-build’ infrastructure configurations must strictly adhere to guidelines specified in the iPatch SOP (see Exhibits - iPatch SOP.pdf). Further, you must contact an iPatch database administrator directly to coordinate the data collection and documentation-deliverable evolution.

Bulk import of key iPatch modeling components can be facilitated by utilization of a specifically formatted spreadsheet (see Exhibits - iPatch Bulk Import.xls).

Updates/changes to fiber patching can be facilitated by utilization of a specifically formatted cut-sheet (see Exhibits – Fiber Patching Cut Sheets.xls).

EQUIPMENT

A. Termination Point
B. Patch Panel
C. Network Switch
D. 110 Block
E. Splice Enclosure
F. Cable Transition
G. EFSO Button
H. Copper Modem
I. Tap
J. Camera
K. AP's

Identification

All Equipment has been assigned a unique GIS database identifier. This identifier serves as a primary- key for each database record. Each record contains additional fields and values relative to the feature identified by the primary-key.

All equipment identifiers follow a specific schema; new equipment must be identified accordingly. In the event that a determination cannot be made regarding the identification of a piece of equipment, please contact an HAS IT GIS representative prior to documenting.

All equipment is identified through a numerical range with prefix characters specific to a respective airport campus, technology asset designation, and feature-category.

Airport Campus Characters:

IAH:	I
HOU:	H
EFD:	E

Asset Designation Character:

Technology: T

Feature-Category Characters:

Structure:	S
Pathway:	P
Equipment:	E
Cable:	C

Numerical Range:

0000 – 9999

Example:

ITE0054 (IAH Equipment), HTE0054 (HOU Equipment), ETE0054 (EFD Equipment)

Labeling

Labeling should follow the identification schema and further be accomplished via the use of below speci- fied labeling device or approved equivalent:

DYMO rhinoPRO 5000 Industrial Label Maker

¾" Flexible Industrial Strength Nylon label tape - yellow

Labels should be affixed to the splice enclosure housing.

Label placement should be affixed to or as near to equipment as possible.

Label all cameras and AP's with VSS ID as programmed into the HAS software system.

Label shall be minimum 14pt font. Use 3-layer engraved lexan label for all interior cameras and AP's. Use metallic die-tapped label for exterior cameras. Label shall be permanently affixed adjacent to the VSS housing. The label shall be visible and may not be attached to the camera housing.

Required Fields

All equipment requires that specific data be collected per unit. GPS equipment should be formatted to account for this information.

EQUIPMENT_I

D

TELECOM_ID

SYMANTEC_T

ICKET

CABLE_ID

TELECOM_CA

BLE_ID

LEGACY_CAB

LE_ID

AIRPORT

AGENCY

PROJECT

PROJECT_C

LASS

COLLECTION

_DATE

COMMENTS

LEGACY_ID

EQUIPMENT

_TYPE

HAS_LEVEL

GPS

No action required for ISP equipment

IDENTIFICATION AND LABELING OF COMMUNICATION INSTRUCTIONS

27 05 33-33

Each splice enclosure (OSP) should be recorded as follows:
Single shots; taken on-center. Offset shots or other means of location are acceptable for splice enclo- sures not available to satellite coverage but these shots or options must be coordinated with an HAS-IT GIS contact prior to.

Supporting Documentation Deliverables

AutoCAD – one-line diagram of ACCESSIBLE for splice enclosures depicting cable identifiers, connec- tions and cable counts for each splice enclosure in both .dwg 2010 or higher and .pdf formats; (See Au- toCAD splice enclosure exhibit).

AutoCAD – rackface layouts of structure units depicting orientation, and/or configurations in both .dwg 2010 or higher and .pdf formats; (See AutoCAD communications room exhibit).

Spatial Data Deliverables

The entire equipment inventory should be delivered separately in ArcGIS feature class (version 10.x) for- mat along with any records outlined in the *'Supporting Documentation"* paragraph. This feature class (EQUIPMENT) should contain the attribute values from the '*Required Fields'* paragraph.

Special Instructions

Do not attempt to open a splice enclosure that appears to be in a fragile state or does not provide for ready access (sealed). Note in 'comments' field that the enclosure was inaccessible.

Do not move, adjust 'live' equipment in order to identify or label. Ask for assistance from qualified HAS Technology Infrastructure personnel.

Do not disconnect cabling in order to identify or label. Ask for assistance from qualified HAS Technology Infrastructure personnel.

A. Outlets

Identification

Each outlet-faceplate is identified specific to its servicing IDF; regardless of the number of

outlets within a given location. All outlet-faceplate ports are labeled to correspond with the servicing IDF panel port. *Note: These space identifiers are architectural identifiers, and are designated by reference to the HAS Infrastructure schema for identifying building spaces. This is not a GIS Technology Infrastructure database identifier.*

Example Outlet-Faceplate Identifier:

S103.1

Translation: Outlet serviced by IDF S103.1

In the event that a determination cannot be made regarding the identity of the outlet, please contact the HAS IT GIS representative prior to documenting.

Note: When planning to identify newly constructed or newly placed HAS assets, the contractor is ex- pected to coordinate with the HAS IT GIS staff prior to labeling. This action will account for all identifiers previously assigned and prevent duplications or omissions.

Labeling

Outlet label placement 2-port: under top-aligned, Plexiglas cover – servicing IDF identifier over port identi- fiers. Ports should be identified left-to-right.

Outlet label placement 3-port: under top-aligned, Plexiglas cover – servicing IDF identifier over port identi- fiers. Ports should be identified left-to-right. Under bottom-aligned, Plexiglas cover – servicing IDF identi- fier over port identifiers. Ports should be identified left-to-right.

Outlet label placement 4-port: under top-aligned, Plexiglas cover – servicing IDF identifier over port identi- fiers. Ports should be identified left-to-right. Under bottom-aligned, Plexiglas cover – servicing IDF identi- fier over port identifiers. Ports should be identified left-to-right. Follow 3-port example.

Outlet label placement 6-port: under top-aligned, Plexiglas cover – servicing IDF identifier over port identi- fiers. Ports should be identified left-to-right. Any mid-faceplate ports will require an adhesive label - servic- ing IDF identifier over port identifiers. Ports should be identified left-to-right. Under bottom-aligned, Plexi- glas cover – servicing IDF identifier over port identifiers. Ports should be identified left-to-right. These types of outlets are ‘Non-Standard’.

Required Fields

No action required
GPS

IDENTIFICATION AND LABELING OF COMMUNICATION INSTRUCTIONS

27 05 33-36

OSP – No GPS action

required ISP – No GPS

action required

Supporting Documentation Deliverables

Additional documentation records are required to support iPatch data. The documentation is as follows:

AutoCAD – floorplan (where applicable) depicting outlet locations; (See AutoCAD communications room exhibit).).

Spatial Data Deliverables

No action required

Special Instructions

Outlets are visibly marked with a reference tag indicating the outlet identifier. Additionally any port associ- ated to the outlet is identified with a port number related specifically back to its respective servicing equipment. Newly placed outlets will require that their identifiers be affixed to the outlet face. Utilize speci- fied labeling device to accomplish the task.

A. Door Contacts

Identification

Each door-contact sensor (without card-reader) is identified by an alpha-numeric sequence specific to its location. All door-contact identifiers are coded with building or complex character, followed by level char- acter, followed by numerical sequence character, followed by ‘CCM’ designation. “CCM’ is an acronym for ‘Control Contact Monitoring.’

Example Outlet-Faceplate Identifier:

B-2057CCM

Translation:

B	(building/complex character)	Terminal B
2	(level character)	Level 2
057	(numerical sequence character)	Contact # 057
CCM	(CCM designation)	Control Contact Monitoring

In the event that a determination cannot be made regarding the identity of a door contact, please contact the HAS IT Project Manager prior to documenting.

Note: When planning to identify newly constructed or newly placed HAS assets, the contractor is ex- pected to coordinate with the HAS IT Project Manager prior to labeling. This action will account for all identifiers previously assigned and prevent duplications or omissions.

Labeling

Door-contacts (without card-reader) require identifier plates per 'Special Instruction' specification below

Required Fields

TBD

GPS

OSP – No GPS action

required ISP – No GPS

action required

Supporting Documentation Deliverables

AutoCAD floorplans indicating door contact location including label plate identifier annotation

Spatial Data Deliverables

No action required

Special Instructions

Install Black Lexan Label Plate: sized 1 ½" X 4", black background, white lettering and Door Alarm Identi- fier engraved (i.e. B-2057CCM). Locate plate on door frame above contact. Clean door frame prior to placement. Affix with 3M double-sided tape.

Provide paper and electronic copies (.pdf format) of all Electronic Lock Permits and Submittal Documents for any door requiring City of Houston door lock permit to the HAS IT Project Manager prior to Acceptance Testing.

B. Card Readers

Identification

Each electronic lock is identified by an alpha-numeric sequence specific to its location. All electronic lock identifiers are coded with building or complex character, followed by level character, followed by numeri- cal sequence character.

Example Outlet-Faceplate Identifier:

C-1015

Translation:

C	(building/complex character)	Terminal C
1	(level character)	Level 1
015	(numerical sequence character)	Lock #

015

In the event that a determination cannot be made regarding the identity of a door contact, please contact the HAS IT Project Manager prior to documenting.

Note: When planning to identify newly constructed or newly placed HAS assets, the contractor is ex- pected to coordinate with the HAS IT Project Manager prior to labeling. This action will account for all identifiers previously assigned and prevent duplications or omissions.

Labeling

Electronic locks require identifier plates per 'Special Instruction' specification below

Required Fields

TBD

GPS

OSP – No GPS action

required ISP – No GPS

action required

Supporting Documentation Deliverables

AutoCAD floorplans indicating card reader location including label plate identifier annotation

Spatial Data Deliverables

No action required

Special Instructions

Install Black Lexan Label Plate: sized approximately 3 ¼" X 5 ½", black background, white lettering and Card Reader Identifier engraved (i.e. C-1015). Affix plate to single-gang cabinet with 5/32" screws.

Provide paper and electronic copies (.pdf format) of all Electronic Lock Permits and Submittal Documents for any door requiring City of Houston door lock permit to the HAS IT Project

Manager prior to Acceptance Testing.

CONNECTIONS

C. Ports

Identification

Each port has been assigned an identifier; combined with the equipment identifier, the sequence be- comes unique. Therefore port identifiers may be replicated on separate pieces of equipment because again, the true and complete port ID is coupled to the equipment ID.

Example:

100.20.01.02.35-39 (equipment ID) +	FP03 =	100.20.01.02.35-39 FP03
100.25.01.01.12-17 (equipment ID) +	FP03 =	100.25.01.01.12-17 FP03

Fiber port 03 is replicated on two different pieces of equipment. Coupling it to the equipment ID makes the string unique

All ports are identified through a numerical range specific to its respective equipment. Ports may be pre- fixed with ‘FP’ (fiber port) or ‘CP’ (copper port) as is pertinent to the cable category and space allows on the equipment.

Regarding service outlets: ports are identified via reference to IDF and IDF equipment (see Outlet). This data should be recorded in the Excel data record tables.

Regarding termination panels: ports are identified according to equipment port capacity.

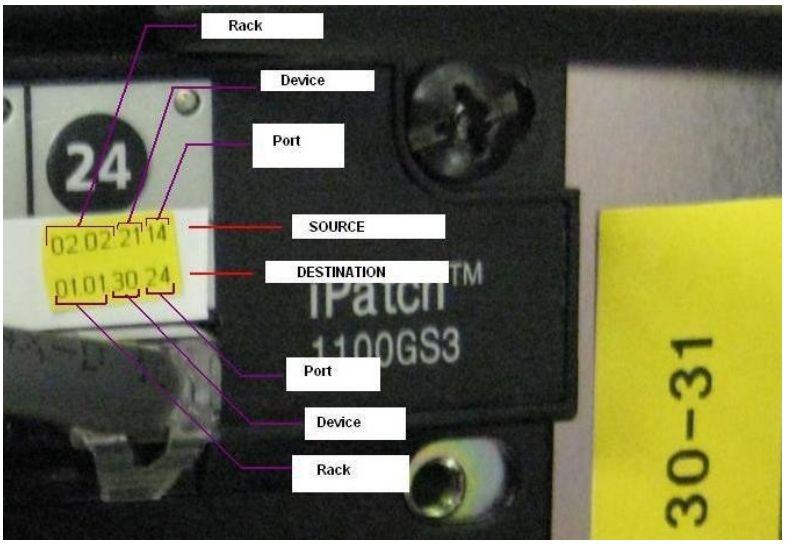
Regarding patch panels: ports are identified in sequence and may be prefixed with structure identifier ref- erences.

Regarding switches: ports are identified in sequence and may be prefixed according to cable compatibil- ity; i.e. ‘FP’ or ‘CP’. The port sequence should follow left-to-right and top-to-bottom.

Regarding devices housing multiple blades: ports are identified in sequence as related to respective blades and may be prefixed according to cable compatibility; i.e. ‘FP’ or ‘CP’. The port sequence should follow left-to-right and top-to-bottom.

Regarding SYSTIMAX (iPatch) ‘equipment panels’: ports are identified with a source-over-destination, (panel-to-panel) schema and inclusive of rack/cabinet (structure-unit) identifiers.

Regarding SYSTIMAX (iPatch) ‘service panels’: ports are identified in sequence and may be prefixed with structure identifier references.



All port identifiers follow some specific schema; new ports must be identified accordingly. In the event that a determination cannot be made regarding the identity of the port, please contact the iPatch database administrator prior to documenting.

Note: When planning to identify newly constructed or newly placed HAS assets, the contractor is ex- pected to coordinate with the HAS IT GIS staff prior to labeling. This action will account for all identifiers previously assigned and prevent duplications or omissions.

Labeling

Regarding switches: generally space does not allow for switch port labeling; ports must be identified how- ever in order to correlate circuit connectivity to/from/through the device.

Labeling should follow the identification schema and further be accomplished via the use of below speci- fied labeling device or approved equivalent:

DYMO rhinoPRO 5000 Industrial Label Maker

¾" Flexible Industrial Strength Nylon label tape - yellow

Labels should be affixed to applicable port locations. Not all ports allow for label placement but these ports should be identified and recorded as part of iPatch SOP; respective to cable or equipment.

Required Fields

Each port requires that its relationship be established between cable and equipment via use of the iPatch cut sheet (see Exhibits – iPatch SOP.pdf).

GPS

No action required

Supporting Documentation Deliverables

ISP cabling/port configurations (see Exhibits – iPatch SOP.pdf)

Spatial Data Deliverables

No action required

Special Instructions

Careful attention should be given to accurately accounting for and recording relationships established between ports – cable, and ports – equipment.

PART 7 STANDARD OPERATING PROCEDURES – BEST PRACTICES

7.1 Data Collection Methodology

A. This section includes a general outline of procedures that can be utilized towards

the collection and processing of HAS' IT physical data requirements. The outline establishes some of the recommended methods which have proven to be most successful during previous data collection cycles.

This guide does not mandate adherence to these methods provided that the contracting party can deter- mine a like process to produce the intended results. Said process must however provide for the specific formatting of all aforementioned physical data deliverables including data record tables, .DWF / .DWG,
.PDF, feature class, feature class, and photo imagery.

Note: Safety is paramount and discussions with regard to OSHA and other regulatory or governing authorities including Airport Operations must be coordinated with the HAS IT representatives prior to commencement of any project scope.

7.2 Outside Plant

A. Identify outside plant network locations as defined by project scope of work including all structures, pathways, cable and equipment. This requires extensive communication and coordination with HAS air- port campus authorities before and during the evolution. Contracting parties will be provided with respective contact information prior to commencement of data collection effort.

Coordinate with HAS IT representative to determine existing network identifiers and to specify any new network identifiers that must be incorporated into data deliverables.

If applicable to the GPS equipment that will be utilized to collect data, format custom projections to cam- pus, format code-list.

GPS locate structures; ensure all attribute fields are populated. For MH, HH produce field sketch - butter- fly layout depicting pathways unit counts orientation; cable types / counts, location. These field sketches should be used to create AutoCAD .DWF / .DWG deliverables.

Produce photo imagery

GPS locate all splice enclosures, slack loops.

Label all end-equipment, splice enclosures, slack loops, cable, pullboxes, cabinets, pedestals. Stamp all MH, HH per guidelines.

GPS locate pathways; ensure all attribute fields are populated.

Physically locate outside plant associated equipment; ensure all attribute fields are populated.

Building Access Points can be approximated where the PATHWAY intersects the building face for pur- poses of GPS data collection; single-shot.

GPS locate cable routing; ensure all attribute fields are populated including end-equipment identifiers.

QA/ QC to ensure that all data relationships have been established; i.e. equipment-structure, structure- pathways, pathways-cable and that all attribute fields have been populated.

Finalize, format deliverables

7.3 Inside Plant

A. Identify inside plant network locations as defined by project scope of work including all structures, cable and equipment. This requires extensive communication and coordination with HAS airport campus authorities before and during the evolution. Contracting parties will be provided with respective contact information prior to commencement of data collection effort.

Coordinate with iPatch database administrator to determine existing network identifiers and to specify any new network identifiers that must be incorporated into data deliverables.

Prepare field sketch (floorplan, rackface) of interior space and equipment. Document and dimension structure space and contents required to generate layouts for the floorplan, cable ladder, conduit,room details, and Install details. Rackface layouts should be created in a separate document. These field sketches should be used to create AutoCAD .DWF / .DWG deliverables.

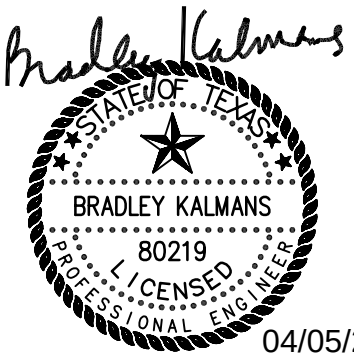
Label all structure units, cable and equipment per guidelines.

Record information specific to iPatch SOP for structure units, equipment, cable; this process will be cov- ered in depth at the coordination meeting held prior to commencement of data collection effort. This in- formation establishes infrastructure relationships that will be used to model the communications environ- ment.

Test Cable.

QA/ QC to ensure that all data relationships have been established; i.e. structure – structure, structure – structure units, structure units – equipment, equipment – ports, ports – cable.

Finalize, format deliverables.



04/05/2024

SECTION 27 10 00

STRUCTURED CABLING SYSTEM

PART 1 GENERAL

1.1. SUMMARY

A. Provide a Structured Cabling System (SCS) for the purpose of supporting voice, data and video communications at various locations within the Houston Airport System. The Houston Airport System (HAS) has established Systimax as the standard for cabling infrastructure installations.

B. Scope of work is to provide horizontal cabling connections to locations shown on drawings. Project consists of providing network connectivity to conveyance and elevator systems.

C. Related Work:
1. Section 270553: Identification and Labeling of Communication Infrastructure
2. Section 271100: Communication Cabinets and Equipment Rooms
3. Section 271300: Backbone/Riser Media Infrastructure
4. Section 270528: Interior Communication Pathways
5. Section 270543: Exterior Communication Pathways
6. Section 270526: Telecommunications Grounding and Bonding
7. Section 272100 Data Communication Network Equipment
8. Section 272200: PC, Laptop and Server Equipment

1.2. SUBMITTALS

A. Qualifications: Demonstrate compliance with requirements of Paragraph 1.05A below.

B. Manufacturers' data, including part numbers, cut sheets and detailed descriptions, for all proposed equipment.

C. Cable inventory data shall be submitted for all fiber, copper, and coaxial cabling and termination equipment. Reference Specification 270553 for the Inside and Outside plant spread sheets. Information shall be provided on a CD.

D. Shop Drawings to be submitted and approved before implementation is started. Shop Drawings to be submitted in accordance with Specification 01340.

E. Include spares list to be approved by HAS IT Project Manager for approval.

F. Cable Testing and Reports.
1. Submit Testing Plan prior to beginning cable testing.
2. Submit certified test reports of Contractor-performed tests in accordance with paragraph 3.04. of this document.
3. Electronic and hardcopy versions of test reports shall be submitted together and clearly identified with cable identification. Test results must be in both PDF and original raw format of approved tester.
4. Test reports shall be reviewed, approved and with a stamped cover letter by the Contractor's on-site RCDD.

G. Product data for all termination and test equipment to be used by Contractor to perform work.
1. Equipment shall be calibrated with traceability to National Institute of Standards and Technology (NIST) requirements.
2. Contractor shall include copy of calibration and certification that equipment calibration meets NIST standards and has been calibrated at least once in the previous calendar year.
3. Test equipment data shall be reviewed, approved and stamped by the Contractor's on-site RCDD prior to submitting.
4. Refer to 3.04. in this document for test equipment requirements.

H. Submit Technology Implementation Plan in accordance with 1.07 below.

I. Submit Cable Pulling Plan, as follows:
1. Indicate the installed backbone conduit layout in schematic format, including junction boxes and distances between junction boxes.
2. Indicate contents of each conduit.
3. Indicate the cable pulling calculations, conduit fill ratios and actual cable runs and tensions.
4. Cable Pulling Plan shall be reviewed, approved and stamped by the Contractor's on-site RCDD prior to submittal.
5. Installation of cabling shall not commence prior to approval of the pulling plan and calculations by the Architect/Engineer.

J. Submit installation plan indicating:
1. Equipment and personnel
2. Materials and staging area
3. Start and completion dates
4. Locations, including floor, room and building
5. Installation plan shall be reviewed, approved and stamped by the Contractor's

on-site RCDD prior to submitting.

1.3. PROJECT CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without fieldmeasurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

C. Maintain temperature of between 64 degrees Fahrenheit and 75 degrees Fahrenheit and between 30 and 55 percent humidity in areas of active electronic system work.

1.4. REFERENCES

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only.

B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect two weeks prior to the date of the Bidding Documents unless the document is shown dated.

C. Conflicts.
1. Between referenced requirements: Comply with the one establishing the more stringent requirements.
2. Between referenced requirements and contract documents: Comply with the one establishing the more stringent requirements.

D. References
1. ANSI/TIA/EIA-568-D, Commercial Building Telecommunications Wiring Standards
2. ANSI/TIA/EIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces
3. ANSI/TIA/EIA 607-B -Commercial Building Grounding and Bonding Requirements
4. International Standards Organization/International Electromechanical Commission

(ISO/IEC) DIS11801, January 6, 1994
5. Underwriters Laboratories (UL□) Cable Certification and Follow Up Program
6. National Electrical Manufacturers Association (NEMA)
7. American Society for Testing Materials (ASTM)
8. National Electric Code (NEC□) Latest Issue
9. National Electrical Safety Code (NESC) Latest Issue
10. Institute of Electrical and Electronic Engineers (IEEE)
11. UL Testing Bulletin
12. American National Standards Institute (ANSI) X3T9.5 Requirements for UTP at 100 Mbps
13. SYSTIMAX Structured Cabling Systems, Performance Specifications, Latest Issue
14. SYSTIMAX Structured Cabling Systems, Components Guide, Latest Issue
15. BICSI Telecommunications Distribution Methods Manual (TDMM) Latest Issue
16. Rural Utilities Service (RUS) Section 1755

1.5. QUALITY ASSURANCE

A. Submit written proof that the following experience requirements are being met.
1. Contractor Qualifications
2. The contractor shall be certified by the manufacturer of the products, adhere to the engineering, installation and testing procedures and utilize the authorized manufacturer components and distribution channels in provisioning this Project.
3. Must be supervised on-site by a BICSI RCDD. Must demonstrate knowledge and compliance with all BICSI, TIA/EIA, UL, and NEC methods, standards and codes.
4. All members of the installation team shall be certified by the manufacturer as having completed the necessary training to complete their part of the installation. Resumes of the entire team shall be provided along with documentation of completedtraining courses.
5. The contractor shall provide five references for projects of equivalent scope, type and complexity of work completed within the last five years.
6. The contractor who is installing the cabling infrastructure shall be a certified and currently registered Elite Systimax Infrastructure Solution Provider capable of issuing a numbered registration certificate for the entire cable system.
7. The contractor who is installing the cabling infrastructure shall have the following Systimax certifications:
SP3321 - SYSTIMAX SCS Design & Engineering
SP/ND3361 - SYSTIMAX SCS Installation and Maintenance
SP7700 – COMMSCOPE Cabling for Smart Buildings
8. The following certification is an approved substitution for the SP3321 and the SP/ND3361
SP3351 – SYSTIMAX SCS MasterClass D&E and I&M Recertification

9. Cable splicing personnel shall have a minimum of five years splicing experience and shall have completed a minimum of five major splicing projects.
10. Manufacturer's hardware experience: All components shall be produced by manufacturers who have been regularly engaged in the production of telecommunications cabling components of the types to be installed in this project for a period of five years.

B. Materials and equipment: Equipment shall be rated for continuous operation under the ambient environmental temperature, humidity, and vibration conditions encountered at the installed location. The equipment shall meet the following requirements:

1. Interior controlled environment: 60 to 100 degrees F dry bulb and 20 to 90 percent relative humidity, non-condensing.
2. Interior uncontrolled environment: 0 to 130 degrees F dry bulb and 10 to 95 percent relative humidity, non-condensing.
3. Exterior environments: Minus 30 degrees to 130 degrees F dry bulb, and 10 to 100 percent relative humidity, condensing.
4. Hazardous environment: All system components located in areas where fire or explosion hazards may exist because of flammable gas or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings, shall be rated and installed according to Chapter 5 of the NFPA 70 and as shown.

C. Standard products:

1. Equipment and materials shall be standard products of a manufacturer regularly engaged in the manufacture of telecommunications cabling products and shall be the manufacturer's latest standard design in satisfactory use for at least one year prior to bid opening.
2. Items of the same classification shall be identical. This requirement includes equipment, modules, assemblies, parts, and components.

1.6. CONTRACTOR'S DUTIES

A. Contractor's RCDD shall provide all calculations and analysis to support design and engineering decisions as specified in the Submittals section.

B. Provide and pay for all labor, supervision, tools, equipment, test equipment, tests and services/programming to provide and install a complete inside and outside plant fiber and copper infrastructure system. Pay all required sales, gross receipts, and other taxes.

C. Secure and pay for plan check fees, permits, fees, and licenses necessary for the execution of Work as applicable for the project.

D. Give required notices.

E. Comply with all codes, ordinances, regulations, and other legal requirements of public authorities that bear on performance of Work.

1.7. PROCUREMENT

A. Procure equipment specified in this document as dictated by the timeline in Appendix A "Technology Implementation Schedule" in order to ensure that the technology is acquired in a timely fashion, but not outdated by the installation date.

B. Submit a copy of Appendix A "Technology Implementation Schedule" as a part of the equipment submittals required elsewhere in this document. Complete the columns headed "Quantity", "Purchasing Lead Time", "Start Date or Dependent", and "Installation Duration".

C. The "Procurement Lead Time" shall be expressed in days or weeks, and shall include time required for the contractor's personnel to order and receive the material. Substantiation may be required.

D. "Start Date or Dependent" and "Installation Duration" should be an accurate estimate based upon known facts in the project. Substantiation may be required.

E. The Contractor shall not purchase any materials requiring submittals until the owner approves the product submittal and the Technology Implementation Schedule for that material.

F. The Contractor shall not purchase any materials requiring submittals until the date established by the owner as the Purchasing Authorized Date. The Purchasing Authorized Date will be reflected in the "Purch Auth" column of Appendix A as a part of the Submittal Review process.

1.8. MAINTENANCE AND SUPPORT

A. System Assurance: The System Assurance shall cover the failure of the wiring system to support the application which it was designed to support, as well as additional application(s) introduced in the future by recognized standards or user forums that use the ANSI/TIA/EIA 568 or ISO/IEC IS 11801 component and link/channel specifications for cabling, for a twenty-year period.

B. System Certification: Upon successful completion of the installation and subsequent

inspection, the customer shall be provided with a numbered certificate, from the manufacturing company, registering the installation.

C. Support Availability: The Contractor shall commit to make available local support for the product and system during the Warranty period.

1.9. EXTENDED WARRANTY

A. The Extended Product Warranty shall meet all manufactures specification to ensure against product defects, that all approved cabling components exceed the specifications of ANSI/TIA/EIA 568 and ISO/IEC IS 11801, exceed the attenuation and NEXT requirements of ANSI/TIA/EIA 568 and ISO/IEC IS 11801 for cabling links/channels, that the installation will exceed the loss and bandwidth requirements of ANSI/TIA/EIA 568 and ISO/IEC IS 11801 for fiber links/channels, for a twenty year period. The warranty shall apply to all passive SCS components.

B. The Extended Product Warranty and the System Assurance shall cover the replacement or repair of defective products and labor for the replacement or repair of such defective products.

1.10. DELIVERY AND STORAGE

A. Equipment shall be delivered in original packages with labels intact and identification clearly marked.

B. Equipment shall not be damaged in any way and shall comply with manufacturer’s operating specifications.

C. Equipment and components shall be protected from the weather, humidity, temperature variations, dirt, dust, or other contaminants. Equipment damaged prior to system acceptance shall be replaced at no cost to the City.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products that may be

incorporated into the Work include, but are not limited to SYSTIMAX SCS and other manufacturers as referenced in this document. However, substitutions for Systimax products are not permitted.

2.02 GENERAL

A. Provide all cabling, terminating hardware, adapters, and cross-connecting hardware necessary to interconnect all system equipment including equipment located in the Main Distribution Facility (MDF) and the Intermediate Distribution Facilities (IDFs).

2.03 COPPER CABLE GENERAL REQUIREMENTS

A. Manufacturer Qualifications: ISO 9001 Certified and included in the Underwriters Laboratories LAN Certification and Follow-up Program.

2.04 COPPER HORIZONTAL CABLING

A. Manufacturer: SYSTIMAX SCS XL7– XX71.

B. Manufacturer: SYSTIMAX GigaSPEED X10D– XX91B (unshielded CAT 6A).

C. Manufacturer: SYSTIMAX GigaSPEED X10D– 2291B (shielded CAT 6A).

D. All horizontal cabling shall meet or exceed the ANSI/EIA/TIA-568 Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components.

E. Cables shall be marked as UL verified with a minimum of Category 6 rating.

F. All horizontal cabling shall be color-coded as follows to differentiate between tenant and owner cabling. All voice circuits will be terminated on patch panels. All horizontal cabling will terminate on patch panels. All tenant and specialty circuits will be cross connected to multi-pair cabling as required.

G. Green – HAS Data. (This applies to all HAS devices needing data cabling)
1. IP Cameras
2. Wireless Access Points (APs) – (Requires two CAT 6A unshielded data cables for

802.11ACv2)
3. Access Control Panels
4. IP Phones
5. High resolution video/video extenders – (CAT 6A shielded data cables)
6. Etc.

H. Yellow – Tenant Data

I. Red – Special circuits, including Automated External Defibrillation (AED) Circuits

J. High performance (71 Series) Category 6 UTP, 4 Pair cabling shall be utilized to provide the signal medium from the individual workstation location to the IDF(s) unless denoted otherwise on the drawings. This cabling shall be installed in accordance with the contract drawings and shall adhere to the specifications listed below:
1. 4 pair UTP
2. 23 AWG Solid Bare Copper
3. Cable jacket shall comply with NEC Article 800 for use as a plenum cable and shall be UL and c (UL) Listed Type CMP.
4. Cable shall terminate on 8 pin modular jack at each outlet.

K. The high performance Category 6 UTP cable shall be of the traditional round design with mylar separator tape between pairs 2/3 and 1/4. The cable shall support Voice, Analog Baseband Video/Audio, Fax, Modem, Switched-56, T-1, ISDN, RS-232, RS-422, RS-485, 10BASE-T Ethernet, Token Ring, 100Mbps TP-PMD, 100BASE-T Ethernet, 155 Mbps ATM, AES/EBU Digital Audio, 270 Mbps Digital Video, 622 Mbps 64-CAP ATM and emerging high-bandwidth applications, including 1 Gbps Ethernet, gigabit ATM, as well as all 77 channels (550 Mhz , single swept margin) of analog broadband video.

L. The high performance Category 6 cables shall meet or exceed the electrical characteristics set by the manufactures specifications.

M. The high performance Category 6 cable shall be specified to 550 MHz and shall meet the guaranteed swept margin as set by the manufacture.

N. High performance (91 Series) Category 6A UTP or F/UTP, 4 Pair cabling shall be utilized to provide the signal medium from the individual workstation location to the IDF(s) unless denoted otherwise on the drawings. This cabling shall be installed in accordance with the contract drawings and shall adhere to the specifications listed below:
1. 4 pair UTP
2. 23 AWG Solid Bare Copper
3. Cable jacket shall comply with NEC Article 800 for use as a plenum cable and shall

be UL and c (UL) Listed Type CMP.

4. Cable shall terminate on 8 pin modular jack at each outlet.

O. Systimax part numbers for Plenum-rated Horizontal Cabling are as follows:

Product Number	Color	COM code	Qty per Unit
2071E YEL C6 4	Yellow	700210123	W1000
2071E SGR C6 4	Green	700210164	W1000
2071E RED C6 4	Red	700210263	W1000
CAT 6A UTP		**Used for WAPs**	
2091B YEL C6A 4	Yellow	760107276	W1000
2091B GRN C6A 4	Green	760107219	W1000
2091B RED C6A 4	Red	760107243	W1000

2.05 VIDEO COAXIAL CABLE (MATV)

A. Manufacturer: CommScope or approved equivalent.

B. The shielded, plenum RG-11 cable shall be used where the horizontal run is greater then 350 feet or specified in the Contract Drawings.
1. Shall consist of a 14-AWG solid-copper conductor. The cable shall be UL and (UL) Listed for Fire Safety and ISO 9001 Certified.
2. CommScope part number – 2287K WHRL RG11 QD 1000 4103304/10
3. Must use compression type connectors from IDEAL part number:
4. IDEAL F connector - #89-011
5. The copper cable shall meet or exceed the electrical specifications set by the manufacture.

C. The Quad shielded, plenum RG-6 cable shall be used as horizontal where specified in the Contract Drawings.
1. Shall consist of an 18-AWG solid-copper conductor. The cable shall be UL and (UL) Listed for Fire Safety and ISO 9001 Certified.
2. CommScope part number – 2227V WHRL RG6 QD 1000 4112704/10
3. Must use compression type connectors from IDEAL part number:
4. IDEAL F connector - RG6-F-XR-RTQ #92-651
5. IDEAL BNC connector - RG6-INSITE-BNC #89-048(security camera install

only)
6. The copper cable shall meet or exceed the electrical specifications set by the manufacture.

2.06 SECURITY CABLES

A. Manufacturer: CommScope or approved equivalent.

B. RG-6(for analog cameras) cable shall be used as horizontal where specified in the Contract Drawings. This cable supplies both video and power media.
1. Shall consist of an 18-AWG solid-copper conductor. The cable shall be UL and (UL) Listed for Fire Safety and ISO 9001 Certified.
2. CommScope part number – 5654
3. Must use compression type connectors from IDEAL part number:
4. IDEAL F connector - RG6-F-XR-RTQ #92-651
5. IDEAL BNC connector - RG6-INSITE-BNC #89-048(security camera install only)
6. The copper cable shall meet or exceed the electrical specifications set by the manufacture.

C. RG-6(for analog cameras) cable shall be used as horizontal OUTDOOR use where specified in the Contract Drawings.
1. Shall consist of an 18-AWG solid-copper conductor. The cable shall be UL and (UL) Listed for Fire Safety and ISO 9001 Certified.
2. CommScope part number – 5720
3. Must use compression type connectors from IDEAL part number:
4. IDEAL F connector - RG6-F-XR-RTQ #92-651
5. IDEAL BNC connector - RG6-INSITE-BNC #89-048(security camera install only)
4. The copper cable shall meet or exceed the electrical specifications set by the manufacture.

D. Composite Cables: Cable between controlled portals and IFPs shall consist of multiple conductor bundles affixed together via a central spline. The conductor bundles shall consist of the following:
1. 4C, 18 AWG 16/30 STR, shielded
2. 3P, 22 AWG 7/30 STR, shielded
3. 2C, 22A AWG 7/30 STR, shielded
4. 4C, 22 AWG 7/30 STR, shielded
5. The composite access control cable shall be Honey Well Genesis 3295 or approved equivalent.

E. 4 CONDUCTOR CABLE (for use with dry contact devices including door position switches, duress alarm switches, etc.
   1. 4 stranded (7 x28) tinned copper conductors
   2. Nominal O.D.: .217”
   3. Belden 9444 or approved equivalent

2.07 FIBER PATCH CORDS

A. Manufacturer: SYSTIMAX Solutions ONLY.

2.08 COPPER HARDWARE TERMINATION STANDARDS - Real Time Infrastructure Management - Intelligent Patch Panel System

A. All horizontal data cables to terminate on iPatch panel.

B. Systimax Solution iPatch Intelligent Fiber Optic Patching System as follows:

Product Number	Description
Fiber Shelves (19 inch rack-mountable) and accessories	
760209940	HD-1U - 1U sliding fiber shelf (holds four modules)
760148502	360-LP-STACK-SPT
760109470	12-LC-LS-AQ-Pigtails
760109496	12-LC-SM-BL-Pigtails
760109504	12-LCA-SM-GR-Pigtails
Copper Patch Panels - Cat 6	
760201137	360-iP-1100-E-GS3-1U-24 - 360 iPatch/imVision(enabled) 24 port panel
760201111	360-iP-1100-E-GS3-2U-48 - 360 iPatch/imVision(enabled) 48 port panel
760152561	360-IPR-1100-E-GS3-1U-24 - 360 iPatch/imVision(ready) 24 port panel
760152579	360-IPR-1100-E-GS3-2U-48 - 360 iPatch/imVision(ready) 48 port panel
Copper Patch Panels - Cat 6A	

760152587	360-IPR-1100-E-GS6-1U-24 - 360 iPatch/imVision(ready) 24 port panel
760152595	360-IPR-1100-E-GS6-2U-48 - 360 iPatch/imVision(ready) 48 port panel

C. Modular Patch Cords
1. Manufacturer: Systimax SCS-GS8E
2. Provide Category 6, Modular Patch Cords for each installed port designated as "Data" in the Drawings.
3. All cords shall conform to the requirements of ANSI/TIA/EIA 568 Commercial Building Telecommunications Cabling Standard, Horizontal Cabling Section, and be part of the UL LAN Certification and Follow-up Program. Cords shall be equipped with an 8 pin modular connector on each end and shall conform to the length(s) specified on the detailed drawing. All Category 6 cordage shall be round, and consist of 23-AWG copper, stranded conductors, tightly twisted into individual pairs and shall meet or exceed the electrical specifications set by the manufacture.

4. UTP Patch cord lengths will be deployed as follows:

Length	Location/Application
3 ft	MDF, IDF, Computer Room, and Lab
5 ft	MDF, IDF, Computer Room, and Lab
7 ft	MDF, IDF, Computer Room, and Lab
9 ft	MDF, IDF, Computer Room, Office, Cubicle, or Lab
15 ft	Office, Cubicle, or Lab

5. Copper patch cord part numbers are as follows:

CAT 6 patch cords		
Product Number	Length	Material ID
CPC3312 -3ft	3FT	CPC3312-04F003
CPC3312 -5ft	5FT	CPC3312-04F005
CPC3312 -7ft	7FT	CPC3312-04F007
CPC3312 -9ft	9FT	CPC3312-04F009
CPC3312 -15ft	15FT	CPC3312-04F015

NOTE: 15 ft. UTP patch cords shall be used at the workstation only.

CAT 6A UTP patch cords		
Product Number	Length	Material ID
CPCSSX2-3ft	3FT	CPCSSX2-04F003
CPCSSX2-5ft	5FT	CPCSSX2-04F005
CPCSSX2-7ft	7FT	CPCSSX2-04F007
CPCSSX2-9ft	9FT	CPCSSX2-04F009

CPCSSX2-15ft	15FT	CPCSSX2-04F015

D. Hybrid RJ45 to 110 Patch Cords.
1. Manufacturer: Systimax 119P2PS
2. As required provide Category 6, Hybrid Patch Cords for each assigned data/voice port on the patch panel. Cords shall RJ45 connector on one end and 110GS on the other end. Cords shall be provided in appropriate lengths to accommodate all tenant voice or specialty ports as shown in detailed drawings. All Category 6 cordage shall be round, and consist of 24-AWG copper, stranded conductors, tightly twisted into individual pair and shall meet or exceed the Category 5e specifications.
3. Hybrid patch cords shall conform to the TIA 568B wiring scheme.
4. Hybrid patch cords shall be provided for each installed port designated as "Tenant Voice or Specialty jack" in the drawings.
5. Hybrid patch cord single pair part numbers are as follows(last 3 digits designates length):

Length	Material ID
8FT	CPC8662-03F-008
10FT	CPC8662-03F-010

6. Hybrid patch cord 4 pair part numbers are as follows(last 3 digits designates length):

Length	Material ID
8FT	CPC8312-03F-008
10FT	CPC8312-03F-010

E. Outlets
1. Manufacturer: Systimax
2. Systimax MGS400(CAT 6)/MGS600(CAT 6A) Modular GigaSpeed Information Outlets - 8 position/8 conductor non-keyed modular outlets for applications up 1 Gbps and ANSI/TIA/EIA 568 compliant for Category 6 or 6A transmission requirements and be part of the UL□ LAN Certification and Follow-up Program.
3. Outlets shall meet or exceed the following electrical and mechanical specifications set by the manufacture.
4. Standard installations shall utilize orange outlets for data. Dust Cover/Blanks shall match faceplate cover.
5. All IMO's (Interactive Media Outlet) shall have at a minimum 4-data ports at each location unless otherwise specified by the contract documents.
6. Systimax Modular GigaSpeed Information Outlets part numbers are as follows:

Product Numbering	# per pack	Color	COM code
MGS400-112	1	Orange	700 206 683

MGS600-112	1	Orange	760 092 379

7. Systimax M-Series Modular Faceplates designed for use with M-Series Modular Information Outlets:

Product Numbering	# of ports	# per pack	Color	COM code
M10L-262	1	1	White	108 258 427
M10LW-262	1 (wall)	1	White	108 258 468
M12L-262	2	1	White	108 168 469
M14L-262	4	1	White	108 168 543

8. Systimax M-Series Modular Surface Mount Box designed for use with one to four M- Series Modular Information Outlets. May be mounted on a flat surface with screws, Box color shall match wall/furniture surface color:

Product Numbering	# of ports	# per pack	Color	COM code
M104SMB-262	4	1	White	107 952 459
M104SMB-270	4	1	Gray	107 952 467

2.09 IDENTIFIERS, LABELS AND LABELING SYSTEM

A. All Identification and Labeling shall follow Specification: 270553–Identification and Labeling of Communication Infrastructure. Any deviation from the specification must be approved by HAS IT prior to installation.

2.10 CABLE MANAGEMENT

A. Horizontal Manager
   1. Manufacturer: CPI – 30130-719

B. Fiber patch cords
   1. Manufacturer: Panduit – Fiber runner(Applies to all new or to expand existing BDF/MDF/Computer room build outs)

2.11 VIDEO APPLICATIONS SHIELDED TWISTED PAIR SOLUTION

A. Shielded Cable
   1. CommScope Shielded Cable, F/UTP Plenum Rated Category 6A, Black Jacket, 1000ft Length

Product Numbering	# per pack	Color	COM code

2291B BK 4/23 R1000 2291B GRN 4/23 R1000	1000ft	Black Green	760171025 760122663

B. Shielded Outlets
1. CommScope Shielded Outlet, Category 6A, F/UTP

Product Numbering	# per pack	Color	COM code
HGS620	1	Silver (F/UTP)	760152801

* If the HGS620 information outlet is to be used at WAO, the depth of any backboxes must be increased.

C. Shielded Patch Panels
1. CommScope Shielded Panel, 1U, 24 Port, F/UTP Flat. imVision / iPatch system preinstalled, ships with 24 shielded outlets

Copper Patch Panels - Cat 6A -Shielded	
760150144	360-IPR-MFTP-E-HD6B-1U-24 – 360 Modular 24 port panel
760151498	360-IPR-MFTP-E-HD6B-1U-48 – 360 Modular 48 port panel

D. High Density M-Series Adapter
1. Systimax High Density M-Series Adapter - White

Product Numbering	# per pack	Color	COM code
HGS-A-MS-WHITE	1	White	760154187

E. Shielded Patch Cords
1. CommScope Shielded Patch Cords, F/UTP, Black Jacket, RJ45-RJ45, 7ft

Product Numbering	# per pack	Color	COM code
PCOSP-6AS-BK-07FT (OSP) G10FP-GR-7FT	1	Black Green	CO11192-01F007 CPCZZK1-01F007

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify raceways, boxes, hand holes and maintenance holes are properly installed following Sections 270528, and 270543.

B. All communication media must be installed in conduit or cable tray unless an alternate method has been approved by HAS/IT.

C. Verify horizontal conduit is minimum 1-inch diameter.

D. Verify backboards are properly installed.

E. Verify telecommunications grounding system is properly installed and tested following Section 270526.

F. Verify liquid-carrying pipes are not installed in or above any IDF/MDF that has active electronic equipment. Do not proceed with installation in affected areas until removed.

3.02 PREPARATION

A. Environmental controlled communication rooms shall maintain temperature of between 64 degrees Fahrenheit and 78 degrees F and between 30 and 55 percent humidity in areas of active electronic system work.

B. Cable Splicing: Exact cable routing, splice enclosure locations, distances, elevations, work space and purpose of splice will be governed by actual field conditions. Contractor shall perform field surveys prior to submitting layout drawings.

C. Contractor’s on-site RCDD supervisor shall review, approve and stamp all shop drawings, coordination drawings and record drawings.

3.03 INSTALLATION

A. Install work following drawings, manufacturer’s instructions and approved submittal data. The number of cables per run, outlet configuration and other pertinent data are included on

the drawings.

B. All installation shall be done in conformance with ANSI/TIA/EIA 568 standards, BICSI methods, Industry standards and SYSTIMAX SCS installation guidelines. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities. Failure to follow the appropriate guidelines shall require the Contractor to provide in a timely fashion the additional material and labor necessary to properly rectify the situation. This shall also apply to any and all damages sustained to the cables by the Contractor during the implementation.

C. The SCS installation shall comply with all applicable national and local codes pertaining to low voltage cable system installations.

D. The contractor shall adhere to the installation schedule of the general contractor and shall attend all construction meetings scheduled by the general contractor.

E. Upon structural completion of the communications room(s) and prior to the installation of any communications equipment or supporting devices inside the room, the HAS IT Representative shall consult the Communications Designer in order to:
1. Perform construction administration activities to compare as-built configuration to the design.
2. Observe all "not-to-design" compliance issues and issue corrective advisement of actions.
3. Upon completion of 1 and 2 above, the Communications Designer shall mark with masking tape the general layout of the equipment placement.

F. All communications conduits shall be identified with color coded orange tape marked "Communications" every 50 feet. Tag conduit termination points (to include J-box locations) with the origination, destination and device name (if applicable) location.

G. Vertical Cabinet Installation
1. All Cabinets shall be properly positioned, leveled, ganged, anchored, grounded and powered.
2. All Cabinets shall be populated as noted in drawings with termination hardware, equipment, proper patch cord lengths, and power outlets.
3. Install and anchor all vertical equipment cabinets to floor following the Drawings and manufacturer's instructions.
4. All cabinets shall be properly ganged in each bay as shown in the Drawings.
5. All cabinet doors shall be configured as shown in the Drawings.
6. All cabinets shall be properly labeled per specification 270553.

7. After final acceptance of the cabinets, coordinate with Owner to replace key/lock with silver barrel on front and back doors.

H. The contractor shall perform all required cross connections of the horizontal cable runs to the backbone cable system. The equipment connections to the data systems shall be performed by the vendors installing and/or maintaining those systems.

I. The contractor is responsible for providing a CD with all the cable/patch panel information in the same format that will be accepted for download in HAS's iPatch/imVision database **1 month** before any patching is completed.

J. The contractor is responsible and must perform the following task associated with the iPatch system:
1. Provide fiber cut sheet depicting fiber port to port or port to equipment connectivity.
2. Label all new devices including the iPatch/imVision Network Manager according to HAS labeling specs.
3. Label all components according to HAS labeling specs.
4. Provide floor plans depicting rooms lay out and outlet locations.
5. Data cabling contractor is to provide and install an iPatch/imVision 48 port copper patch panel for all new network switches/blades that are related to the project. Provide solid conductor patch cables with RJ-45 on one end and terminate the other end on the patch panel. Patch port 1 of the patch panel to port 1 on the switch until all ports on the switch are connected to the patch panel matching the port numbers.

K. The contractor shall provide service loops (slack) for cables terminating in the IDFs. A 6-foot service loop shall be provided above the access ceiling or cable trays unless specified otherwise. This allows for future changes or expansion without installing new cables.

L. The installation contractor shall be responsible for coordination, testing and problem resolution with the system vendors.

M. City inspector or their designated representative shall randomly perform unannounced, on-site reviews during the installation. In addition, this person shall perform a final inspection and a complete review of the test results before the installation is accepted.

N. Upon completion of the installation, Contractor shall prepare as-built documentation of the entire SCS. This documentation shall include:
1. As-Built Drawings
   a. All drawings shall be provided on disk in a form compatible with AutoCAD Version
      1. A complete set of project plans will be provided by the Contractor on CD.

b. A complete diagram of all terminations in the IDFs.
c. A complete diagram of all copper, fiber, and coax riser cable.
d. A complete diagram of all copper, fiber, and coax inter-building cable.
e. Floor plans showing exact cable routings with each outlet clearly marked with cable number.
f. A complete diagram of all cable tray, conduits and conduit sleeves.

2. Documentation
   a. All cable inventory data documentation shall be submitted in designated as specified in specification 270553
   b. Documentation on horizontal cable shall include cable number and length of cable.
   c. Complete cross connect documentation is required. This information will include detailed documentation of all four pairs of each horizontal cable and every pair of all copper riser and inter-building cable and every fiber of fiber optic cable.
3. As-built Drawings and Documentation shall be reviewed, approved and stamped by Contractor's on-site RCDD.

3.04 POST-INSTALLATION TESTING AND CERTIFICATION

A. Contractor Requirements
1. Contractor shall provide sufficient skilled labor to complete testing within a reasonable test period.
2. Contractor shall have a minimum of three years of experience installing and testing structured cabling systems. All installers assigned by the Contractor to the installation shall be certified by the factory to install and test the provided products.
3. Contractor is responsible for supplying all of the required test equipment used to conduct acceptance tests.
4. Contractor is responsible for submitting acceptance documentation as defined in 3.04.D below. No cabling installation is considered complete until test results have been completed, submitted and approved as defined in 3.04.D below.
5. Contractor to insure that the database information for iPatch meets the HAS requirements.

B. Test Procedure
1. HAS IT Representative reserves the right to be present during any or all testing. Notify HAS IT Representative at least 48 hours prior to beginning test procedures.
2. Testing shall be of the Permanent Link. However, Contractor shall warrant performance based on Channel performance and provide patch cords that meet channel performance.
3. All cabling not tested strictly in accordance with these procedures shall be re-tested at no additional cost to the Owner.

4. Testing of all copper and fiber wiring shall be performed prior to system(s) cutover.
5. 100% of the installed cabling shall be tested. All tests shall pass acceptance criteria defined in 3.05 below.
6. Cable testing shall be performed by a fully charged tester, and the charging unit shall be disconnected during testing.
7. Any pairs not meeting the requirements of the standard shall be brought into compliance by the contractor at no charge to the City. Complete end-to-end test results shall be submitted to the City.

C. Standards Compliance and Test Requirements
1. Copper Cabling shall meet the indicated performance specifications:
   a. Category 6 Horizontal Cabling shall be tested to the manufactures specification for Category 6 Cabling and SYSTIMAX SCS GigaSpeed System.
2. All test equipment used shall meet the performance specifications defined in 3.04.

D. Cable Test Documentation
1. Test reports shall be submitted in hardcopy and electronic format and certified by the contractor's RCDD to be a complete and accurate record of cabling installed. 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, cable length, date of test, and pass/fail result.
3. Electronic reports shall be submitted on CD in PDF format. Electronic reports shall be accompanied by a Certificate signed by an authorized representative of the Contractor warranting the truth and accuracy of the electronic report. Certificate shall reference traceable circuit numbers that match the electronic record.
4. Hardcopy and electronic reports for each cable route shall be submitted together in one submittal. The submittal description shall include the type of test performed, type of cable, and cable ID (including originating and terminating room numbers) of cable tested. Partial or unclear documentation will be returned without reviewing.
5. Test reports shall include the following information for each cabling element tested:
   a. Wiremap results that indicate that 100% of the cabling has been tested for shorts, opens, miswires, splits, polarity reversals, transpositions, presence of AC voltage and end-to-end connectivity.
   b. For Category 6 cabling: Attenuation, NEXT, PSNEXT, Return Loss, ELFEXT, and PSELFEXT data that indicate the worst case result, the frequency at which it occurs, the limit at that point, and the margin. These tests shall be performed in a swept frequency manner from 1 MHz to highest relevant frequency, using a swept frequency interval that is consistent with TIA and ISO requirements. Information

hall be provided for all pairs or pair combinations and in both directions when required by the appropriate standards. Any individual test that fails the relevant performance specification shall be marked as a FAIL. Test shall also include mutual capacitance and characteristic impedance.

c. Length (in feet), propagation delay, and delay skew relative to the relevant limit. Any individual test that fails the relevant performance specification shall be marked as a FAIL.
d. Cable manufacturer, cable model number/type, and NVP
e. Tester manufacturer, model, serial number, hardware version, and software version
f. Circuit ID number and project name
g. Autotest specification used
h. Overall pass/fail indication
i. Date of test

6. Test reports shall be submitted within seven business days of testing.

E. Test Equipment

1. Test equipment used under this contract shall be from manufacturers that have a minimum of 5 years of experience in producing field test equipment. Manufacturers shall be ISO 9001 certified.
   a. Category 6 – At minimum a Level III tester or submitted and owner-approved equivalent.
   b. Refer to spec section 27 13 00 for fiber testing procedures.
2. All test tools of a given type shall be from the same manufacturer, and have compatible electronic results output.
3. Test adapter cables shall be approved by the manufacturer of the test equipment. Adapters from other sources are not acceptable.
4. Baseline accuracy of the test equipment shall exceed TIA Level III, as indicated by independent laboratory testing.
5. Test equipment shall be capable of certifying Category 6 links.
6. Test equipment shall have a dynamic range of at least 100 dB to minimize measurement uncertainty.
7. Test equipment shall be capable of storing full frequency sweep data for all tests and printing color graphical reports for all swept measurements.
8. Test equipment shall include S-Band time domain diagnostics for NEXT and return loss (TDNXT and TDRL) for accurate and efficient troubleshooting.
9. Test equipment shall be capable of running individual NEXT, return loss, etc measurements in addition to autotests. Individual tests increase productivity when diagnosing faults.
10. Test equipment shall include a library of cable types, sorted by major manufacturer.
11. Test equipment shall store at least 250 Category 6 autotests (in full graphic format) in internal memory, with the option for additional storage card via expansion slot.

12. Test equipment shall be able to internally group autotests and cables in project folders for good records management.
13. Test equipment shall include DSP technology for support of advanced measurements.
14. Test equipment shall make swept frequency measurements in compliance with TIA standards.
15. The measurement reference plane of the test equipment shall start immediately at the output of the test equipment interface connector. There shall not be a time domain dead zone of any distance that excludes any part of the link from the measurement.

3.05 ACCEPTANCE

A. Once all work has been completed, test documentation has been submitted and approved, and HAS IT Representative is satisfied that all work is in accordance with contract documents, the HAS IT Representative will notify Contractor in writing of formal acceptance of the system.

B. Acceptance Requirements
1. Contractor's RCDD shall warrant in writing that 100% of the installation meets the requirements specified under 3.04. "Standards Compliance & Test Requirements" above.
2. HAS IT Representative reserves the right to conduct, using Contractor equipment and labor, a random re-test of up to five percent of the cable plant to confirm documented results. Random re-testing, if performed, shall be at the expense of the City, using standard labor rates. Any failing cabling shall be re-tested and restored to a passing condition at no cost to the City. In the event more than two percent of the cable plant fails during re-test, the entire cable plant shall be re-tested and restored to a passing condition at no additional cost to the Owner.
3. HAS IT Representative may agree to allow certain cabling runs to exceed standardized performance criteria (e.g. length). In this event, such runs shall be explicitly identified and excluded from requirements to pass standardized tests.
4. Acceptance shall be subject to completion of all work, successful post-installation testing which yields 100% PASS rating, and submittal and approval of full documentation as described in 3.04.
5. See Appendix A & B. Acceptance requirements are not limited to these sheets

3.06 DEMOLITION

A. The contractor shall be responsible for maintaining all communications service to areas of

the building scheduled to remain in service during the period of renovation.

B. Notify HAS Information Technology (IT) department 30 days prior to the start of demolition work taking place in existing communications rooms. Coordinate removal of equipment and cabling within existing communications rooms with HAS IT.

C. Where removal is indicated in Drawings, remove communications cable from termination point back to originating communications room, MDF or tenant communications room. Coordinate removal at terminating blocks and panels with HAS IT. Coordinate removal of cross-connects and patch cables with HAS IT.

D. Ensure systems and circuits are no longer active before removing and prior to the demolition of existing communications rooms. If active circuits exist at time of scheduled demolition, coordinate with HAS IT Representative to reroute or deactivate circuit(s).

E. Demolition and removal of cabling shall not impact the operation of active systems.

F. Unless otherwise noted, discard all removed cable, patch cables and cross-connects. Except where re-routing of cable is specified in Drawings or by Designer, do not reuse cable.

G. Remove all loose unterminated cabling to source found above ceiling, under floor or in wall.

H. Demo all abandoned cable in accordance with NEC 800.25.

3.07 CLEANING

A. Remove all unnecessary tools and equipment, unused materials, packing materials, and debris from each area where Work has been completed unless designated for storage.

MDF/IDF Check List

This list is intended as a minimum checklist. CM should ensure that the contractor's schedule has built in these components and the necessary buffer period – and associated access restrictions to the communications equipment rooms -- for HAS IT and tenant IT to prepare.

1. All communication rooms that will service the area to be opened must be completed. That means a final walkthrough of these areas has been completed. It is not necessary that the entire project achieve substantial completion, but IT cannot install equipment and begin work until the following minimum criteria is met:
    a. Space is built out and clean – free from dust/residues.
    b. Electrical w/UPS as required.
    c. All racks/cabinets installed and mounted. Padlocks eyes have been installed.
    d. Grounding bus bar installed and properly tied to main grounding bus bar in MDF
    e. HVAC functioning properly and is adequately filtering dust. Humidity is controlled.
    f. Door access control is installed (card reader) -or- an approved temporary provision. Simple key access is not permissible.
    g. Lighting is installed and operational.
    h. Cable trays/ladder racks installed and ready to use.
    i. Permanent or temporary signage identifying permanent room number.

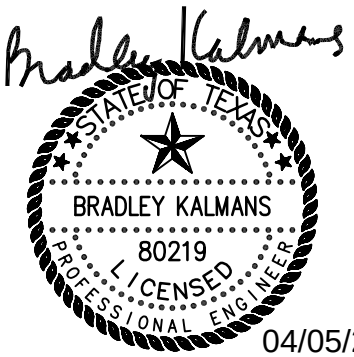
2. All cabling necessary to operate the areas to be opened is completed.
    a. Backbone cabling (copper and fiber) from the applicable communication room(s) is installed, tested, labeled, and approved by the inspector and communications design consultant.
    b. Horizontal cabling for all areas to be occupied is installed, tested, labeled, and approved by the inspector and communications design consultant.
    c. Copper cross connects and/or fiber jumpers have been installed per the owner/tenant require- ments.
    d. Cable records and redline drawings for installed cables are submitted and approved PRIOR to putting any active circuits on the new cables. Cable records reflect all installed cables **and** any cross connects or jumper assignments installed by the contractor.
    e. All iPatch Panels are programmed and operational.
    f. All jumpers and patch cords specified by the contract are transmitted to the owner for use.
    g. NOTE: cable labels and permanent room numbers need to match. CM needs to be sure to get de- sign team, airport, IT, and CM / contractor reps together to review permanent room numbers prior to contractor installing cable labels.

3. Move-in buffer period needs to be minimum 6 **weeks** for HAS-IT to install/extend services within the area to be occupied prior to occupation of the facility or spaces. Additional time may be necessary if Tenant IT organization is involved, or if contractor has other systems that must be configured/tested which require
HAS-IT resources (i.e. cabling or data network connections). This is frequently the case for PA System, tele- vision, radio, Fire Alarm, pay telephone, EFSO (Electronic Fuel Shutoff), access control & CCTV, etc.

4. Once HAS-IT accepts a communications equipment room and begins to install/configure equipment in preparation for hosting live applications, this room becomes a restricted area with access to be controlled by HAS-IT. Contractors must be substantially complete with systems inside the communications equipment room so that access is generally not required. Minor punch list and scheduled testing with escort can be ar- ranged, but access will be very limited.

5. Other IT-related systems that must be operational, tested, and accepted or approved temporary provisions.
    a. PA System
    b. MATV and/or CNN TV (where applicable)
    c. Fire Alarm
    d. MUFIDS
    e. Pay Telephones (where applicable)
    f. EFSO (where applicable)
    g. Access Control & CCTV (note: must be PROGRAMMED, and approved acceptance test walk through by HAS)
    h. Crash phone (where applicable)
    i. Radio system enhancements (where applicable)
    j. Data Network switch installed and configured.

END OF SECTION



04/05/2024

SECTION 26 08 00
COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

A. The Cx activities shall follow all requirements as defined in Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS.

B. The section below describes unique Cx activities to the Electrical Systems and the electrical portions of the conveyance systems.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Provide all necessary test equipment to confirm proper operation of the Electrical Systems.

B. All testing equipment shall be properly calibrated, and documentation of such calibration shall be submitted prior to any verification testing.

PART 3 - EXECUTION

3.1 PARTICIPATION IN Cx

A. As applicable, the Division 26 subcontractor shall take the lead in Cx of the following Electrical Systems:
1. Lighting Control Systems
2. Energy Power Monitoring System
3. Switchgear
4. Motor Control Centers
5. Transformers

B. The Division 26 subcontractor and Lighting Control System – Not Used

C. Division 26 subcontractor shall fully support after-hours (night-time) testing such as “black-site” testing as directed by the Prime Constructor under the supervision of the CxA. Additional afterhours testing may be required if initial tests fail to pass.

D. If applicable, coordinate with the Division 23 and BAS subcontractors for performing and documenting pre-functional checks for each of the equipment items in the scope for Cx.

E. If applicable, Division 26 subcontractor and the Division 23 BAS subcontractor are responsible for completing Point-to-Point testing, pre-functional testing, pre-verification testing and functional testing of the BAS interface to the specified Electrical Systems.

F. If applicable, Coordinate with the Division 28 Fire Alarm System subcontractors for performing and documenting pre-functional checks for each of the equipment items in the scope for Cx.

G. If applicable, Coordinate with the Division 28 Access Control and Video Surveillance subcontractors for performing and documenting pre-functional checks for each of the equipment items in the scope for Cx.

3.2 DISTRIBUTION OF TREND DATA

A. Trend data from the BAS will be utilized in the Cx activities. Contractor shall provide at least 1 full week of trend data to the Cx Team no later than 1 week before scheduling the functional performance testing. The Cx Team will analyze the trend data from the equipment and systems to be tested as part of the determination whether the testing can be scheduled.

B. Trend data shall be recorded at intervals no greater than 15 minutes. The trend data from each field controller shall be polled and stored in a central location with capability of archiving the collected trend data for no less than 3 months of storage. The BAS shall be capable of automated distribution of the trend data configured for no greater than weekly updates of the previous interval of data. Change of Value (COV) trending is not preferred and shall only be acceptable for status or binary command points.

C. Trend data shall be saved in a non-proprietary format such as csv or txt with consistent organization of the data to include at a minimum the timestamp, BAS system trend name, value and units. Trend reports shall contain both data represented in tabular format as well as line charting.

3.3 PRE-FUNCTIONAL TEST FORMS

A. After the initial equipment submittal phase, the CxA shall prepare the pre-functional test forms for each item of equipment as part of the Cx. Review respective pre-functional test forms for accuracy and completeness and provide comments to the General Contractor and CxA.

B. The following is a sample prefunctional test form:

CHK-1: Automatic Transfer Switch (ATS)

Test Type: **Pre-Functional Testing**

Asset Summary

Unit #	Automatic Transfer Switch (ATS)
Discipline	

Equipment Verification

Equipment / Component	Approved Submittal Data	Installed As Submitted?	Installed Data
Manufacturer			
Model number			
Serial number			
Operating voltage			
Current rating			
Ampacity			
Neutral Configuration			
Transition Type			
Priority			
Close and Withstand Rating			
Software version			

Questionnaire

#	Question	Answer	Details
	Installation		
1	Bypass/ isolation switch is installed	☐ Yes ☐ No ☐ N/A	Electrical Contractor_____
2	Equipment interiors are complete and clean	☐ Yes ☐ No ☐ N/A	Electrical Contractor_____
3	Equipment is secured to concrete housekeeping pad	☐ Yes ☐ No ☐ N/A	Electrical Contractor_____
4	Working clearance: 277/480V - 42" to grounded surface; 48" to exposed live parts	☐ Yes ☐ No ☐ N/A	Electrical Contractor_____
5	Switch provided with test switch to simulate failure of normal source	☐ Yes ☐ No ☐ N/A	Electrical Contractor_____
6	Switch provided with pilot lights to indicate normal and emergency position of transfer switch	☐ Yes ☐ No ☐ N/A	Electrical Contractor_____
7	Switch provided with pilot lights to indicate availability of normal and emergency sources	☐ Yes ☐ No ☐ N/A	Electrical Contractor_____
8	Switch provided with terminal blocks labeling all external connections	☐ Yes ☐ No ☐ N/A	Electrical Contractor_____
9	Transfer switch provided with transfer override switch to cause switch to remain connected to emergency source regardless of condition of normal source	☐ Yes ☐ No ☐ N/A	Electrical Contractor_____
10	Transfer switch provided with a retransfer switch to bypass retransfer time delay	☐ Yes ☐ No ☐ N/A	Electrical Contractor_____

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#	Question	Answer	Details
11	Remote annunciation is provided and wired to the transfer switch (annunciator panel, BAS)	☐ Yes ☐ No ☐ N/A	
			Elevator Contractor_____
	Instrumentation		
1	Verify metering provided as specified	☐ Yes ☐ No ☐ N/A	
			Electrical Contractor_____
2	Display and control unit are mounted flush or semiflush in instrument compartment door	☐ Yes ☐ No ☐ N/A	
			Electrical Contractor_____
	Identification		
1	Verify label installed as specified	☐ Yes ☐ No ☐ N/A	
			Commissioning Authority_____
2	Bypass/isolation operating instructions are provided on the front of the unit	Yes ☐ No N/A	
			Commissioning Authority_____
3	Verify additional labeling is complete	Yes ☐ No ☐ N/A	
			Commissioning Authority_____
4	Verify conductors are properly color coded	Yes ☐ No ☐ N/A	
			Commissioning Authority_____

END TEST

3.4 FUNCTIONAL TEST FORMS

A. After the finalization of the pre-functional test forms, the CxA shall prepare the functional test forms for each system to be documented as part of the Cx. Review respective functional test forms for accuracy and completeness and provide comments to the General Contractor and CxA.

B. The following is a sample functional test form:

FPT-1: Automatic Transfer Switch (ATS)

Test Type: **Functional Performance Testing**

Asset Summary

Unit #	Automatic Transfer Switch (ATS)
Discipline	

Questionnaire

#	Question	Answer	Details
	Auto Start		
1	PROCEDURE: Open the normal power breaker serving the ATS	Yes No N/A	
2	VERIFY by visual response that:	Yes No N/A	
3	ATS LED "Normal Power Available" indicator is off.	Pass Fail N/A	
4	Time delay (2 seconds) occurs prior to start signal being sent to generator system	Pass Fail N/A	
5	The generator receives start signal following time delay to verify loss of utility power.	Pass Fail N/A	
6	Generator is up to speed and voltage within (~6) seconds of receipt of start signal.	Pass Fail N/A	
7	ATS LED indicates "Emergency Power Available".	Pass Fail N/A	
8	ATS does not transfer to emergency power due to presence of time delay inhibit signal (5 seconds).	Pass Fail N/A	

#	Question	Answer	Details
9	ATS transfers to neutral position for scheduled delay per 263623.2.2.N.2	☐ Pass ☐ Fail ☐ N/A	
10	At conclusion of time delay, ATS transfers to the emergency source.	☐ Pass ☐ Fail ☐ N/A	
	Bypass		
1	TEST PROCEDURE: Place transfer switch in bypass (E)	☐ Yes ☐ No ☐ N/A	
2	EXPECTED RESPONSE: Switch bypasses to the emergency source.	☐ Pass ☐ Fail ☐ N/A	
3	EXPECTED RESPONSE: Bypass is a closed transition process	☐ Pass ☐ Fail ☐ N/A	
	Isolate from Emergency Bypass		
1	TEST PROCEDURE: Move isolation handle to "Isolate"	☐ Yes ☐ No ☐ N/A	
2	EXPECTED RESPONSE: Transfer switch base is released (for inspection, maintenance, etc.)	☐ Pass ☐ Fail ☐ N/A	
3	EXPECTED RESPONSE: Switch base is capable of being replaced into ATS and taken out of Bypass	☐ Pass ☐ Fail ☐ N/A	
	Auto Stop		
1	PROCEDURE: Close the normal power breaker serving the ATS.	☐ Yes ☐ No ☐ N/A	
2	The ATS indicates normal power is available.	☐ Pass ☐ Fail ☐ N/A	
3	Time delay begins to verify stability of normal power (These time delays for Priority 2 ATS's are staggered to provide delays between loads adding from generators to utility - See 263623.2.2.N.2).	☐ Pass ☐ Fail ☐ N/A	
4	At end of time delay, ATS transfers to neutral position for scheduled delay per 263623.2.2.N.2	☐ Pass ☐ Fail ☐ N/A	
5	At conclusion of time delay, ATS transfers load to normal power	☐ Pass ☐ Fail ☐ N/A	
6	ATS indicates both normal and emergency power available.	☐ Pass ☐ Fail ☐ N/A	
7	The generator begins cool down cycle.	☐ Pass ☐ Fail ☐ N/A	
8	The generator automatically stops.	☐ Pass ☐ Fail ☐ N/A	
9	ATS LED "Emergency Power Available" indicator off.	☐ Pass ☐ Fail ☐ N/A	

#	Question	Answer	Details
	Bypass (Normal)		
1	TEST PROCEDURE: Place transfer switch in bypass (N)	☐ Yes ☐ No ☐ N/A	
2	EXPECTED RESPONSE: Switch bypasses to the normal source.	☐ Pass ☐ Fail ☐ N/A	
3	EXPECTED RESPONSE: Switch base is capable of being replaced into ATS and taken out of Bypass	☐ Pass ☐ Fail ☐ N/A	
	Test Start		
1	Prior to generator shutdown, Test Start is initiated.	☐ Yes ☐ No ☐ N/A	
2	PROCEDURE: Activate test switch in face of ATS.	☐ Yes ☐ No ☐ N/A	
3	VERIFY by visual response that:	☐ Yes ☐ No ☐ N/A	
4	ATS initiates start signal to generator.	☐ Pass ☐ Fail ☐ N/A	
5	Generator is up to speed and voltage within (~6) seconds of receipt of start signal.	☐ Pass ☐ Fail ☐ N/A	
6	The ATS verifies synchronization of normal and emergency sources and transfers the load to emergency power (momentary closed transition).	☐ Pass ☐ Fail ☐ N/A	
7	The ATS indicates that both normal and emergency power are available.	☐ Pass ☐ Fail ☐ N/A	
	Test Stop		
1	PROCEDURE: Restore test switch to normal in face of ATS, if applicable	☐ Yes ☐ No ☐ N/A	
2	VERIFY by visual response that:	☐ Yes ☐ No ☐ N/A	
3	Time delay begins to verify stability of normal power.	☐ Pass ☐ Fail ☐ N/A	
4	At conclusion of time delay, ATS verifies synchronization of normal and emergency sources and transfers load to normal power (momentary closed transition).	☐ Pass ☐ Fail ☐ N/A	
5	ATS indicates both normal and emergency power available.	☐ Pass ☐ Fail ☐ N/A	
6	The generator goes begins cool down cycle.	☐ Pass ☐ Fail ☐ N/A	
7	The generator automatically stops	☐ Pass ☐ Fail ☐ N/A	
8	ATS LED "Emergency Power Available" indicator off.	☐ Pass ☐ Fail ☐ N/A	

#	Question	Answer	Details
	Metering Communication		
	The following metered data shall be communicated to the BMCS System:		
1	Phase to neutral voltages	☐ Pass ☐ Fail ☐ N/A	
2	Phase currents	☐ Pass ☐ Fail ☐ N/A	
3	Power Factor	☐ Pass ☐ Fail ☐ N/A	
4	Peak KW Demand	☐ Pass ☐ Fail ☐ N/A	
	The following ATS status parameters are communicated to the BMCS System:		
1	Generator status	☐ Pass ☐ Fail ☐ N/A	
2	ATS Switch Position / Source Connection Status	☐ Pass ☐ Fail ☐ N/A	
3	Source 1 Status	☐ Pass ☐ Fail ☐ N/A	
4	Source 2 Status	☐ Pass ☐ Fail ☐ N/A	
5	ATS Alarm	☐ Pass ☐ Fail ☐ N/A	

END TEST

END OF SECTION

SECTION 27 05 00

COMMUNICATIONS BASIC MATERIALS, METHODS, AND GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Except as modified in this Section, General Conditions, Supplementary Conditions, applicable provisions of Division 01 General Requirements, and other provisions and requirements of the Contract Documents apply to work of Division 27 Communications.

B. Applicable provisions of this section apply to all sections of Division 27, Communications.

C. The general provisions of the Contract and the requirements of the following Sections apply to the Work specified in this Section. See following sections for related general and specific requirements following sections shall associate with this specification as applicable.
1. Division 26 in its entirety.
2. Division 27 in its entirety.
3. Division 28 in its entirety.

D. The entire drawing and specification package apply to the work specified in the communication specifications and shall be complied with in every respect. The Contract Documents are comprised of the drawings and specifications. The Contractor shall examine these Contract Documents, and coordinate required work indicated in each.

1.2 CODES AND STANDARDS

A. All equipment and work performed shall comply with current and applicable Codes, Standards, Rules, Ordinances, Regulations, and Best Practices (both published and best practices) as well as any other authorities that may have lawful jurisdiction pertaining to the work specified. None of the terms or provisions of this specification shall be construed as waiving any of the rules, regulations, or requirements of these authorities (including those not specifically listed in this Specification). Applicable Codes and Standards shall consist of, but not be limited to the following:
1. Americans with Disabilities Act (ADA)
2. Authorities Having Jurisdiction (AHJ) - Local
3. American National Standards Institute (ANSI)

4. American Society of Testing and Materials (ASTM) *Communications Cables - B694, B736, D4565, D4566, D4730, D4731, D4732*
5. Building Industry Consulting Services International (BICSI)
6. Code of Federal Regulations - Title 47
7. Electronics Industries Association (EIA) *Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Connecting and Terminating Devices - EIA-455 Series*
8. Federal Communications Commission (FCC) - Communications Act and FCC Rules
9. Federal Information Processing Standards (FIPS) *Federal Building Standard for Telecommunications Pathways and Spaces - FIPS PUB 175, FIPS PUB 176*
10. The Insulated Cable Engineers Association (ICEA) *Communications Cable Stands - P-47-434, S-56-434, S-80-576, S84-608, S-85-625, S-86-634, S-87-640, S-89-648, S-90-661, S-98-688, S-99-689, S-100-685*
11. International Electro-technical Commission (IEC)
12. Institute of Electrical and Electronic Engineers (IEEE) *Local Area Networks/Metropolitan Networks Standards Collection - LAN/MAN 802 Series*
13. International Organization for Standardization (ISO) (ISO/IEC) *Premise Wiring Core and LAN/MAN Core Equivalents-11801, 8802, 14763-1*
14. International Telecommunication Union (ITU-T) *Telecommunications Standardization*
15. National Electrical Code (NEC) *National Electrical Code - NFPA 70*
16. National Electrical Contractor's Association (NECA) *Standards of Installation*
17. National Electrical Manufacturers Association (NEMA) *Performance Standard for Twisted Pair Premise Voice and Data Communications Cable-WC 63.1, WC 63.2, WC 66*
18. National Electrical Safety Code (NESC)
19. National Fire Protection Association (NFPA) - *National Fire Alarm Code NFPA 72, Life Safety Code NFPA 101*
20. Society of Cable Telecommunications Engineers (SCTE)
21. Local Accessibility Standards
22. Telecommunications Industries Association (TIA) *(ANSI/TIA/EIA) Wiring and Cabling Standards - 526, 568, 569, 570, 571, 598, 606, 607, 758, TSB 31-B, 63, 67, 72, 75 and 95*
23. Uniform Building Code (UBC)
24. Underwriters Laboratories, Inc. (U.L.) - *497A, 910, 1077, 1863, 1283, 1459, 1604, 1651, 1681, 1690, 1778, 1977*

B. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract. After Contract award, any correction or additions necessary for compliance with applicable codes shall be made at no additional

cost to the Owner.

C. This Contractor shall be responsible for being aware of and complying with asbestos NESHAP regulations, as well as all other applicable codes, laws and regulations.

D. Obtain all permits required.

1.3 SUMMARY

A. The work covered by the specifications includes furnishing materials, labor, transportation, tools, permits, fees, utilities, and incidentals necessary for the complete installation of work required in the Contract Drawings.

B. It is the intent of the Contract Documents to provide a new and/or an extension of the existing installation, as shown in the associated specifications and drawings, complete in every respect.

C. Provide complete and working Communications Systems including equipment, conduit, wiring, material, labor and training as described in this Specification and the Drawings. The Communications Systems Drawings and Specifications are the sole property of the Architect and are not to be duplicated, scanned, loaned or in any way made available to persons not designated as authorized by the Architect. All Communications Systems plans, and specifications are to be returned to the Architect following completion of bid.

1.4 CONTRACTOR'S QUALIFICATIONS

A. An approved contractor for the work under this division shall be:
   1. A specialist in this field and have the personnel, experience, training, and skill, and the organization to provide a practical working system.
   2. Able to furnish evidence of having contracted for and installed not less than ten (10) systems of comparable size and type that have served their Owners satisfactorily for not less than 3 years.
   3. Perform work by persons qualified to produce workmanship of specified quality. Persons performing work shall be required to be licensed. Onsite supervision shall have minimum of the following:
      a. Licenses, as applicable to the system being installed
      b. Manufacturer's Certifications
         1) Firm Certification
         2) Installer Certification
         3) Programmer's Certification
         4) System Designer Certification.

1.5 DRAWINGS AND SPECIFICATIONS

A. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.

B. If variations or departures from the drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Consultant for review. No departures shall be made without prior written acceptance of the Consultant.

C. Should the drawings or specifications disagree in themselves or with their counterpart, the better quality or greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Consultant in writing, shall be performed or furnished. In the case that the specifications should not fully agree with the Schedules, the latter shall govern. Figures indicated on drawings govern scale measurements and large-scale details govern small scale drawings.

D. The approximate locations of system equipment and components are indicated on the Drawings. These Drawings are not intended to give complete and accurate details in regard to location of equipment, field devices, etc. Exact locations are to be determined by actual measurements at the building and will in all cases be subject to the Review of the Owner or Consultant, who reserves the right to make any reasonable changes in the locations indicated without additional cost to the Owner.

E. Items specifically mentioned in the Specifications but not shown on the Drawings and/or items shown on Drawings but not specifically mentioned in the Specifications shall be installed by the Contractor under the appropriate section of work as if they were both specified and shown.

F. Any discrepancies between the Contract Documents and actual job site conditions shall be reported to the Owner or Consultant, so that they will be resolved prior to the bidding, where this cannot be done at least 7 working days prior to bid; the greater or costlier of the discrepancy shall be bid. All labor and materials required to perform the work described shall be included as part of this Contract.

G. It is the intention of this Section of the Specifications, and associated drawings, to outline minimum requirements to furnish the Owner with a turnkey and fully operating system in cooperation with other trades.

H. The contract documents are schematic in nature in that they are only to establish scope and a minimum level of quality. They are not to be used as actual working construction drawings. The actual working construction drawings shall be the shop drawings accepted by project’s consultant.

I. The Contractor shall be responsible for coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with the existing site conditions, details of the work and the working conditions, and verify dimensions in the field. The Contractor shall advise the project's consultant of any discrepancy prior to bidding. The submission of bids shall be deemed evidence of the Contractor's site visit; coordination of existing conditions and include consideration for existing conditions.

J. These documents are conceptual in nature. It shall be the responsibility of the approved installer to furnish a complete and functional system, including the items shown on the drawings, in the specifications, and items not designated in either. The installer's shop drawings and product data submittals shall represent a complete system and documents accepted by the project's consultant shall not relieve the installer from being required to provide any materials, equipment, or labor to furnish a complete and functional system as recognized by the Project's Technology Consultant and the Owner.

1.6 BUILDING CONSTRUCTION AND LAYOUT OF WORK

A. General: It shall be the responsibility of the Contractor to consult the Engineering Drawings and Details so as to thoroughly familiarize himself with the type and quality of construction to be provided on this project.

B. The drawings are diagrammatic in nature and do not show every connection in detail or every line or conduit in its exact location. These details are subject to the requirements of all codes, ordinances, and standards; as well as all structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in closed ceiling space and/or furred chases unless specifically noted or indicated to be exposed. Work shall be installed to avoid crippling of structural members. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted.

C. The approximate location of equipment items is indicated on the drawings. Exact locations are to be determined by coordination of dimensions from approved equipment submittals and site-verified field measurements and will in all cases be subject to the approval of the Consultant. The Consultant reserves the right to make any reasonable changes in the indicated locations prior to installation for no additional cost.

D. In areas of existing special ceiling construction, the removal and restoration must

be carefully planned such that the existing condition of the ceilings is maintained. It may be necessary for the Contractor to procure a Subcontractor familiar with this work to achieve this requirement.

E. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

1.7 RELATION WITH OTHER TRADES

A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements. Extend electrical services and final connections to all items requiring same.

B. Because of the complicated relationship of this work to the total project, conscientiously study the relation and cooperate as necessary to accomplish the full intent of the documents.

C. Where cabling pass through walls or floors, metal sleeves shall be provided and shall be sealed to prevent spread of fire and smoke. In walls, they shall extend 3” beyond the finished surface. In pipe chases, they shall extend 8” inches above floor slab and be cemented in a watertight manner. Size of these sleeves shall be at least as required to maintain a maximum 40% conduit fill ratio.1/2 inch greater than outside diameter of the conduit.

D. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.

E. Refer to other Divisions of the specifications for the scope of required connections to equipment furnished under other Division. Determine from the General Contractor / Construction Manager for the various trades, the Owner, and by direction from the Architect / Engineer, the exact location of all items. The construction trades involved shall furnish all roughing-in drawings and wiring diagrams required for proper installation of the electrical work.
   1. Make final connections to all communications equipment indicated on the drawings, except as noted.

F. Request all Shop Drawings required in ample time to permit proper installation of all electrical provisions.

G. Extend services as indicated to the various items of equipment furnished by others. Rough-in for the various items and make final connections ready for

operation upon placing of the equipment.

1.8 CONCEALED AND EXPOSED WORK

A. When the word "concealed" is defined as hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is defined as open to view, in plain sight.

1.9 GUARANTEE

A. Guarantee work for a minimum of two years or as noted longer elsewhere from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. At the Owner's option, replacement of failed parts or equipment shall be provided.

1.10 MATERIAL AND EQUIPMENT

A. Furnish new and unused materials and equipment meeting the requirements of the paragraph specifying acceptable manufacturers. Where two or more units of the same type or class of equipment are required, provide units of a single manufacturer.

1.11 NOISE AND VIBRATION

A. Select equipment to operate with minimum noise and vibration. If noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, and judged objectionable by the Owner, Architect, or Engineer, rectify such conditions at no additional cost to the Owner. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

1.12 ACCEPTABLE MANUFACTURERS

A. Manufacturers names and catalog number specified under sections of Division 27 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a named manufacturer shall be acceptable on approval. A request for prior approval of equipment not listed must be submitted ten (10) days before proposal due date. Submit complete design and performance data to the Architect. The Architect and Owner issue approvals of acceptable manufacturers as addenda to the Construction Proposal Documents.

B. Where acceptable manufacturers are listed, only products of those manufacturers

may be provided. Additionally, the product must meet all the detailed requirements of the specifications.

C. If no manufacturer's name is mentioned, the Contractor shall provide equipment and material which meet the specifications.

1.13 UTILITIES, LOCATIONS AND ELEVATIONS

A. Locations and elevations of the various utilities included within the scope of this work:
   1. Obtained from utility maps and other substantially reliable sources.
   2. Are offered separate from the Contract Documents as a general guide only without guarantees to accuracy.

B. Examine the site and verify the location and elevation of all utilities and of their relation to the work. Existing utilities indicated on the site plans are for reference only and shall be field verified by the Contractor with the respective public or private utility.

1.14 CONTRACT DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.

B. It is the responsibility of the Contractor to compare the scale of all electrical drawings with the scale of the architectural drawings and make adjustments to all electrical drawings which have the incorrect drawing scale so that his material takeoffs are not in error due to an incorrectly labeled drawing scale and his proposal is complete.

1.15 ABBREVIATIONS AND DEFINITIONS

A/V	Audio/Visual
AWG	American Wire Gauge
BCR	Building Communications Room
CATV	Cable Antenna Television
CCTV	Closed Circuit Television
CMP	Communications Media Plenum
CMR	Communications Media Riser
dB	Decibel
EMI	Electromagnetic Interference
ER	Equipment Room
FACP	Fire Alarm Control Panel
FCR	Floor Communications Room

Gbps	Giga Bits Per Second
Hz	Hertz
IC	Intermediate Cross-connect
IDF	Intermediate Distribution Frame
IM	Information Management
IS	Information Systems or Information Services (also see MIS)
IT	Information Technology
Km	Kilometer
LCD	Liquid Crystal Display
LED	Light Emitting Diode
M	Micron
MATV	Master Antenna Television *(A.K.A. Main Antenna Television)*
Mbps	Mega Bits Per Second
MC	Main Cross-connect
MDF	Main Distribution Frame
MHz	Megahertz
MIS	Management Information Systems or Services
NEXT	Near-End Cross Talk
nm	Nanometer
OFN	Optical Fiber Non-conductive
OFNP	Optical Fiber Non-conductive Plenum
OFNR	Optical Fiber Non-conductive Riser
OTDR	Optical Time Domain Reflectometer
PBX	Private Branch Exchange
POS	Point of Sale
PSELFEXT	Power Sum Equal Level Far-End Cross Talk
PSNEXT	Power Sum Near-End Cross Talk
SMATV	Satellite Main Antenna Television
TC	Telecommunications Closet *(Now referred to as TR)*
T.O.	Telecommunications Outlet
TR	Telecommunications Room *(A.K.A. TC - Telecommunication Closet)*
UTP	Unshielded Twisted Pair Wire

Definitions:

Administration Subsystem - Cable, connectors, cross-connect and inter-connect hardware, patch cords, and other equipment that allows easy reconfiguration of the telecommunications system to accommodate personnel and floor plans changes.

Campus Backbone Subsystem - Connects telecommunications processing equipment in different buildings on the same campus.

Communications Cabling - Any fiber optic, copper, coaxial or other transmission media used for transmitting or receiving communications systems data.

Communications System - Communications Systems and associated wired or wireless interconnection.

Communications Drawings - All floor plans, elevations, details, schematics, block diagrams, legends, tables, notes or attachments associated with any or all of the Communications Systems.

Distribution Cable - The telecommunications UTP wiring between the telecommunications room and the outlet connectors.

Equipment Subsystem - Telecommunications cable, connectors, support hardware, blocks, and protective devices that serve to connect the network interface and the backbone subsystem through the administrative subsystem.

Horizontal Subsystem - Telecommunications cable, outlets and distribution cords that extend the riser backbone from the administrative points in the TRs to workstations.

Information Systems - Software systems including operating systems, programs, data manipulation and management systems, control software and various forms of proprietary and off-the-shelf software.

Information Technology - The practical application of knowledge associated with designing, installing and maintaining the equipment, hardware and infrastructure utilized for control, distribution, or display of telecommunications, audio, video and data signals. Because computers are central to information management, computer departments within companies and universities are often called (IT Departments) and are responsible for MIS or IS personnel and services.

Low Voltage Wire - Wire or cable used for one or more systems that operate on 24 volts or less. Low Voltage Wire is used to install and interconnect one or more of the Communications Systems. Low Voltage Wire includes patch cords, jumpers and all portions of cable or wire used to make the Communications Systems operational or for system communications.

Management Information Systems - A class of software that provides managers with tools for organizing and evaluating their department. Typically, MIS systems are written in COBOL and run on mainframes or minicomputers. Within companies and large organizations, the department responsible for computer systems is sometime called the MIS department. Another name for MIS is Information Services (IS).

Multiplexer - A communications device that multiplexes (combines) several signals for transmission over a single medium. A multiplexer is sometimes called a "mux". A demultiplexer is required to complete the process by separating multiplexed signals from a transmission line. Frequently a multiplexer and demultiplexer are combined into a single device capable of processing both outgoing and incoming signals.

Riser Backbone Subsystem - Telecommunications cable, splice enclosures, and associated hardware that provide the main cable routes in a building. It interconnects building floors and larger areas of a single floor. It also interconnects administrative points in satellite TRs to the administrative points in the building main equipment room.

Station Cable - The wiring between the outlet connections and the work area equipment.

Communications Systems - One or more of the following and associated equipment: Data/Networking Systems, Telecommunications Systems, Paging / Intercom Systems, Clock/Control Systems, Master Antenna Television Systems, Cable Antenna Television Systems, Broadcast Video Systems, Audio/Visual Presentations Systems, Microwave/Wireless Systems.

Telecommunications - The transmission, emission or reception of signs, signals, images, sound or intelligence of any nature by wire, radio, optical or other technical transmission system.

Work Area - Location of an employee or student and their data/telecommunications equipment or devices.

Work Area Subsystem - Station mounting cords, extension cords, connectors, adapters, and interface units that provide physical and electrical connectivity between workstation equipment and the horizontal subsystem.

1.16 QUALITY ASSURANCE

A. Equipment Standards:
   1. System and all components shall be brand new stock from manufacturer.
   2. All electronics shall be 100% solid state.
   3. System and all components shall bear a UL Label.

B. Contractor Qualifications:
   At the time of Proposal, the Contractor shall:
   1. Have manufactured, supplied or installed at least three (3) other systems of

similar size, complexity, and general operation as the systems described in these specifications. The Contractor shall furnish in writing to Architect proof of compliance with this paragraph at the time of proposal.

2. Hold all legally required Texas State Contractor's licenses necessary to accomplish the installation and activation of the described system at the facilities indicated. The Contractor shall submit copies of licenses to the Architect prior to the start of work
3. Hold all legally required state registrations to meet local requirements for submittal drawings.
4. Have a local office within fifty (50) miles of the project site staffed with factory trained technicians who have experience on systems of similar complexity and function as the systems described in these specifications. These technicians shall be fully capable of system engineering support, installation supervising, system start-up, and providing the Owner with training and service on both hardware and software for the systems specified.
5. Certify complete and total compliance with the provisions of these specifications by letter or submittal of the proposal response forms, signed by an officer of the corporation, or a principal if other ownership currently exists. In addition, the letter or forms shall include a complete listing of exceptions, if any.

1.17 SUBMITTALS

A. Provide SUBMITTALS according to Division 01 and the following.

B. Requirements:

1. Submit paragraph-by-paragraph specification review indicating compliance or deviation with explanation.
2. Submit proof that all system components and cables are U.L. Listed.
3. An equipment list with names of manufacturers, model numbers, and technical information on all equipment proposed. Clearly mark exact model number proposed to be installed.
4. Product technical information sheets for each principal component in the proposed system, including cable, wire, terminal marking, and wire marking material.
5. Certification from the manufacturer stating that the system Contractor is an authorized distributor or installer of the proposed system when such certifications exist.
6. A statement listing every technical and operational parameter wherein the submitted equipment varies from that which was originally specified. If the submitter fails to list a particular variance and his submittal is accepted but is subsequently deemed to be unsatisfactory because of the unlisted variance, the submitter shall replace or modify such equipment at once and

without cost to the Owner.

1.18 EXAMINATION OF SITE

A. The Contractor shall have visited the site and familiarized himself with all existing conditions prior to submitting his proposal and shall be prepared to carry out the work within the existing limitations. Failure or neglect to do so shall not relieve the Contractor of his responsibilities not entitle him to additional compensation for work overlooked and not included in his proposal.

B. The Contractor shall confirm the availability of the proper power source for each piece of specified equipment, through site visits and Drawings as necessary. Where proper power does not exist, the Contractor shall provide the required power, circuits, outlets, conduits, and wire as specified under Division 26.

1.19 DATA ACCURACY

A. Absolute accuracy of information regarding existing conditions cannot be guaranteed. The Drawings and Specifications are for the assistance and guidance of the Contractor and exact locations, distances, elevations, etc., shall be governed by actual field conditions. Where variations from the contract documents are required, such variations shall be approved by the Architect / Owner.

1.20 SECURITY

A. The Contractor is responsible for complying with all of the Owner's and facility security's requirements to prevent theft or damage to equipment, tools and materials. If any deviation from facility security requirements is necessary, approval for such deviation shall be coordinated with the Owner.

B. The Contractor shall not disclose any confidential information of the Owner. The Contractor acknowledges that such action is highly injurious and can do damage to the Owner. The Contractor will agree to and comply with the standard policies and provisions of the Owner regarding outside Contractors and Consultants.

1.21 UTILITIES

A. It shall be the responsibility of the Contractor to provide all temporary connection and cables, lighting, light stands and power. The facilities shall be used in accordance with all applicable regulations regarding operations, safety and fire hazards of the governmental Authorities Having Jurisdiction, provided they are not used in a wasteful manner.

1.22 PERMITS

A. All permits required for the specified performance and completion of the work shall be secured by the Contractor. These permits shall be presented and reviewed at the initial project progress meeting.

1.23 NOTIFICATION

A. The Contractor shall not shut off any existing systems. The Contractor shall give the Owner at least ten (10) calendar day's notice of any requirements to shut off or interference with existing alarm, regulating, computer or other service systems. The Owner will arrange and execute any shutdown. All work such as splicing, connections, etc., necessary to establish or re-establish any system shall be completed by the Contractor in close coordination with the Owner.

1.24 INTERFERENCES WITH THE OWNER

A. Transportation and storage of materials at the facility, work involving the facility, and all other matters affecting the habitual use by the Owner of its buildings, shall be conducted so as to cause the least possible interference, and at times and in a manner acceptable to the Owner. The Contractor shall make every effort to delivery equipment per the schedule required by the project.

1.25 PROJECT RECORD DOCUMENTS

A. Maintain at the job site a separate set of white prints (blue line or black line) of the contract drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is significantly at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various major and minor feeders, equipment, and other pertinent items, as installed. Record underground and under-slab cables installed, dimensioning exact location and elevation of such installations.

B. At conclusion of project, obtain without cost to the Owner, electronic AutoCAD 2014 or later / Revit CAD files of the original drawings and transfer as-built changes to these. Provide the following as-built documents including all contract drawings regardless of whether corrections were necessary and include in the transmittal: "2 sets of CDs and prints for Owner's use, one set of CDs, prints, and mylars for Architect / Engineers Records". Delivery of these as-built electronic, reproducible and prints is a condition of final acceptance.
   1. 3 sets of electronic AutoCAD (2014 dwg or later) / Revit CAD drawing files, on CD-ROM media, of each contract as-built drawing.
   2. One reproducible Dayrex mylar film positive of each contract as-built

drawing.

3. Three sets of blue or black-line prints of each contract as-built drawing.

C. As-Built Drawings should indicate the following information as a minimum:
   1. Indicate all addendum changes to documents.
   2. Remove Engineer's Seal, name, address, and logo from drawings.
   3. Mark documents AS-BUILT DRAWINGS.
   4. Clearly indicate: DOCUMENT PRODUCED BY:
   5. Indicate all changes to construction during construction. Indicate actual routing of all conduit and cables, etc that were deviated from construction drawings.
   6. Indicate exact location of all underground communications raceways, and elevations.
   7. Correct schedules to reflect (actual) equipment furnished and manufacturer.
   8. During the execution of work, maintain a complete set of Drawings and specifications upon which all locations of equipment, devices, and all deviations and changes from the construction documents in the work shall be recorded.
   9. Exact location of all communications equipment in building. Label panel schedules to indicate actual location.
   10. Exact location of all communications equipment in and outside of the building.
   11. Location, size and routing of all communications cables, conduits, equipment, etc. shall be accurately and neatly shown to dimension.
   12. Exact location of all roof mounted equipment, wall, roof and floor penetrations.
   13. Cloud all changes.

1.26 OPERATING TESTS

A. After all communications systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequencing and operation throughout the range of operation. Tests shall be made in the presence of the Architect / Engineer and Owner. Provide minimum 24-hour advance notice of scheduling of all tests. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. Submit 3 copies of all certifications and test reports adequately in advance of completion of the work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

1.27 WARRANTY

A. All equipment shall be covered for the full manufacturers warranty period and

systems shall be warranted by the Contractor for a period of two years commencing with the filing date of substantial completion. The Warranty shall cover all costs for warranty service, including parts, labor, prompt field service, pick-up, transportation, delivery, reinstallation, and retesting. A contract for service shall cover the period starting with the first expected activation of each system and shall continue without interruption to cover the period to the end of the two-year warranty as defined above. The end of the warranty period shall be handled such that a smooth transition to a maintenance agreement with the Owner shall be achieved with no lapse in coverage.

B. Submit 3 copies of all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

1.28 BUILDING CONSTRUCTION

A. It shall be the responsibility of the sub-contractor to consult the Architectural and Engineering drawings, details and specifications and thoroughly familiarize himself as to the construction and all job-related requirements. All construction trades shall cooperate with the General Contractor / Construction Manager job site superintendent and lay out work so that all piping, cables, pathways, raceways, and other items are placed in the walls, furred spaces, chases, etc., so that there shall be no delay in the job.

1.29 TEMPORARY FACILITIES

A. General: Refer to Division 01 for general requirements on temporary facilities.

B. Temporary Wiring: Temporary power and lighting for construction purposes shall be provided under Division 26. Installation of temporary power shall be in accordance with NEC Article 305.

C. Temporary facilities, wire, lights and devices are the property of this Contractor and shall be removed at the completion of the Contract.

1.30 EXTRA MATERIALS

A. Keys: Provide three (3) sets of all keys for system cabinets.

PART 2 - PRODUCTS

2.1 WORK INCLUDED

A. All materials listed in PART 2 - PRODUCTS of this Division Sections and on the

Drawings shall be provided by the Contractor unless specifically excluded or modified in other portions of this Specification or Addendums.

2.2 GENERAL MATERIALS AND EQUIPMENT REQUIREMENTS

A. Materials, in general, shall conform to the National Electrical Code requirements and shall be listed, inspected, and approved by the Underwriters Laboratories and shall bear the UL label where labeling service is available. The label or listing of the Underwriters Laboratories, Inc. will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this listing, the Contractor may submit a statement from a nationally recognized, adequately equipped testing agency, indicating that the items have been tested in accordance with required procedures, and that the materials and equipment comply with all Contract requirements.

2.3 STANDARD PRODUCTS

A. Materials and equipment shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications and shall essentially duplicate materials and equipment that have been in satisfactory use at least two (2) years prior to bid opening. Where custom or special items are required, these shall be fully described using drawings, material lists, etc., which fully describe in detail the item proposed for use on this project.

2.4 MANUFACTURE'S INSTRUCTIONS

A. The Contractor is responsible for furnishing the proper Communication equipment and/or material and for seeing it is installed as intended by the manufacturer. The Contractor shall, wherever necessary, request advice and supervisory assistance from equipment manufacturers as required for the proper installation, operation, or start-up. The Contractor shall notify the Consultant, in writing, of any conflict between the Contract Documents and the manufacturer's recommendations and shall obtain, from the Consultant, instructions/direction before proceeding with the work. The Contractor shall pay for all costs resulting from deficiencies created by installation not in accordance with the manufacturer's recommendations or the instructions of the Consultant.

2.5 RUST PREVENTION

A. Metallic materials shall be protected against corrosion. Exposed metallic parts of equipment exposed to the elements shall be given a rust inhibiting treatment and standard finish by the manufacturer. Components such as boxes, bodies, fittings, guards, and miscellaneous parts shall be protected in accordance with the ASTM

A123 or A153, except where other equivalent protective treatment is specifically approved in writing.

2.6 STORAGE AT SITE

A. The Contractor shall not receive material or equipment at the job site until ready for installation or until there is suitable space provided to properly protect equipment from rust, weather, humidity, dust, or physical damage.

B. All electronic equipment, containing sealed lead acid batteries or gel cells, shall be stored in climate-controlled area until installed or reinstalled. Do not store in non-climate controlled connex storage units.

C. Storage is to be provided and secured by the contractor. In the event that the Owner should agree to furnish storage space, security of the space and its contents shall remain the responsibility of the contractor.

2.7 CONDITION OF MATERIALS

A. All materials required for the installation of the Communication systems shall be new and unused. Any material or equipment damaged in transit from the factory, during delivery to premises, while in storage on premises, while being installed, or while being tested, until time of final acceptance, shall be replaced by this Contractor without extra cost to Owner.

2.8 NAMEPLATES

A. Factory assembled components and equipment shall be provided with be factory stamped labeling. Labeling will have information required to specifically identify the component and/or equipment in the future such as the manufacturer's name, catalog number, serial number, etc. All data on the labels shall be legible at the time of final inspection.

2.9 ACCESS DOORS

A. Wherever access is required in walls or ceilings to concealed junction boxes, pull boxes, equipment, etc., installed under this Division, furnish a hinged access door and frame with flush latch handle to another Division for installation. Doors shall be as follows:
   1. Plaster Surfaces: Milcor Style K.
   2. Ceramic Tile Surfaces: Milcor Style M.
   3. Drywall Surfaces: Milcor Style DW.
   4. Install panels only in locations approved by the Architect.

2.10 SPACE LIMITATIONS

A. Equipment shall be chosen which shall properly fit into the physical space provided and shown on the drawings, allowing ample room for access, servicing, removal and replacement of parts, etc. Adequate space shall be allowed for clearances in accordance with applicable codes and standards. Physical dimensions and arrangement of equipment shall be subject to the approval of the Consultant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. This project has a critical path, which must be closely followed in order to meet the completion date. The Contractor shall review the proposed schedule at the Award of Contract meeting and be prepared to staff his work force according to the schedule constraints presented at that time.

B. Aesthetics are an important consideration in this installation. All components shall be installed so as to have aesthetically pleasing results as determined by the Owner and Architect. Actual locations of all visible components shall be coordinated in advance with the Owner and Architect.

C. Install, make fully operational and test the system as indicated on the Drawings and in the Specifications. Where information is not available the worst-case condition must be assumed to ensure a complete, functional system.

D. Any interfacing with other systems shall be the Contractor's responsibility under this contract, and the details, both logical and physical, of such interfaces shall be reflected in the Submittals and As-Built drawings.

E. If appropriate, interfaces with the Owner's Data Network, Telecommunications and Communications System shall be coordinated with the Owner and Architect.

F. All necessary back boards, back-boxes, pull-boxes, connectors, supports, conduit, cable and wire shall be furnished and installed to provide a complete and reliable system. Exact location of all backboards, boxes, conduit and wiring runs shall be presented to the Owner / Architect for approval in advance of any installation. Provide as required and as specified in Division 26.

G. Where required provide 120-VAC, 60 Hz power from nearest electrical panel through a junction box, to the system devices. Provide as required and as specified in Division 26.

H. Where required, install conduit, cable and wire parallel and square with building lines, including raised floor areas. Conduit fills shall not exceed 40%.

I. Ground busses shall be provided in each any room with communication equipment.

J. All equipment shall be mounted with sufficient clearance to minimize EMI as well as meet all applicable codes and facilitate observation and testing. Securely hand and/or fasten with appropriate fittings to ensure positive grounding, free of ground loops, throughout the entire system. Units shall be installed parallel and square to building lines.

K. Communications grounding system shall be a single point grounding from the building entrance electrical ground to each Communications room.

L. All Conduit systems, cabinets' racks, cable trays, protector blocks, SCTP patch panels and/or miscellaneous equipment, etc. shall be grounded by being connected to the common communications grounding system. The conductors shall be a # 6awg solid with a green jacket

M. Quiet and vibration-free operation of all equipment is a requirement of this installation. Properly adjust, repair, balance or replace any equipment producing objectionable (in the judgment of the Owner or Architect) noise or vibration in any of the occupied areas of any building and provide additional brackets and bracing if necessary. Any such additions or changes shall be at no additional cost to the Owner.

N. Installation shall comply with the CODES AND STANDARDS portion of this Section. Where more than one code or regulation if applicable, the more stringent shall apply.

O. Where new equipment is replacing old equipment, the Contractor is responsible for removing and disposing of the old equipment and doing whatever repair work is necessary as specified by the Owner / Architect.

P. Install firestopping, as specified in Division 26 for all penetrations in slabs and firewalls to meet code at the completion of work and prior to final testing demonstration to the Owner.

Q. The installation shall be performed in a professional manner.

R. On a daily basis, clean up and deposit in appropriate containers all debris from work performed under the appropriate specification sections. Stack and organize all parts, tools and equipment when not being used.

S. Preparation, handling and installation shall be in accordance with the Manufacturer's written instructions and technical data appropriate to the product specified.

T. All work shall conform to the National Electrical Contractor's Association "Standard of Installation" for general installation practice.

U. At the conclusion of the installation, all work areas, including all enclosures and boxes, shall be vacuumed and cleaned to remove all debris and grease.

3.2 COORDINATION WITH OWNER / ARCHITECT

A. Close coordination with the Owner / Architect is vital to achieve a complete, aesthetically pleasing job. The Contractor shall ensure that the Owner / Architect is kept fully apprized of job progress.

3.3 CUTTING, PAINTING, AND PATCHING

A. Structural members shall not be drilled, bored or notched in such a manner that shall impair their structural value. Cutting of holes in structural members, if required, shall be done with core drills and only with the specific approval of the Owner / Architect for each instance.

B. All walls that require cutting or repair during the installation process shall be returned to their original condition, including the matching of colors and finishes to the satisfaction of the Owner / Architect, and at no additional cost to the Owner.

3.4 WIRE AND CABLE

A. All low voltage cable shall be low smoke plenum rated, limited energy, with 300-volt insulation.

B. All wires in exposed areas shall run through conduit as specified in Division 26.

C. Provide conduits, cable trays, raceways, wireways, boxes and outlets as specified in Division 26.

D. After installation, and before termination, all wiring shall be checked and tested to insure there are no grounds, opens, or shorts on any conductors. In addition, all wires between buildings or underground and all coax cables shall have insulation tested with a megohmmeter (megger) and a reading of greater than 20 megohms shall be required to successfully complete the test.

E. Run wires continuously from termination to termination without splices.

F. Wire and cable shall be supported in each equipment and terminal cabinet and in each terminal and pull box in vertical risers and horizontal runs with wire duct and strap-type supports. At any point where wire duct is required for good wire management, whether shown on elevations or not, install appropriate duct. Where terminal boards are used, wire ducts shall be supplied on both sides and at not rime shall wires cross over terminal boards. Arrange cables neatly to allow inspection, removal and replacement. Lace cables as required. Spot tie wire bundles with plastic cable ties and securely affix to panels. If screw type terminals are specified, terminal strip connections shall be locking, tongue style, pressure crimp, and solderless spade lug.

G. Visually inspect wire and cable for faulty insulation prior to installation. Protect cable ends at all times with acceptable end caps except during actual termination. At no time shall any coaxial cable be subjected to a bend less than a 6-inch radius. Protect wire and cable from kinks. Install 1 pull rope for all 2” or larger sized conduits.

H. Provide plastic bushings and strain relief material at all conduit exit points and where necessary, to avoid abrasion of wire and excess tension on wire and cable.

I. Cables above accessible ceilings shall not rest on ceiling tiles. Use Velcro tie wraps, J-hooks or D-rings to hold cables. Provide independent support for all cables. Support is to be from building structure (do not support from pipes or conduits). Communications cables shall not tie off on HVAC supports, all-thread, ceiling grid hanger wire or electrical / mechanical piping system.

J. Ground and bond equipment and circuits in accordance with NEC and Division 26.

3.5 IDENTIFICATION AND TAGGING

A. All cables, wires, wiring forms, terminal blocks and terminals shall be identified by labels, tags to other permanent markings in accordance with TIA/EIA-606. The markings shall clearly indicate the function, source, or destination of all cabling, wiring and terminals. All cables and wires shall be identified, utilizing heat-shrink, machine printed, polyolefin wire markers (Brady Type B-32 *or equal*). Handwritten tags are not acceptable.

B. Should a situation arise where the wire tagging format as shown on the drawings cannot be used, a substitute format shall be submitted which complies with the intent to provide documentation that will permit end-to-end tracing of all

Communications Systems wiring.

C. All panels shall be provided with permanently attached engraved lamacoid labels with identifying names and functions. All terminal points shall be appropriately labeled. Labels shall be consistent in form, color, and typeface throughout the system and all must contain the name of the system or subsystem as part of the label textual information. Design, color, font and layout shall be coordinated with, and approved by, the Owner.

D. Identification of Equipment:
   1. All major equipment shall have a manufacturer's label identifying the manufacturer's address, equipment model and serial numbers, equipment size, and other pertinent data. Take care not to obliterate this nameplate. The legend on all nameplates or tags shall correspond to the identification shown on the Operating Instructions.
   2. A black-white-black 3 layer laminated plastic engraved identifying nameplate shall be permanently secured to each wireway, terminal cabinet, and communications (voice, data, video) cabinet or rack.
      a. Identifying nameplates shall have 1/2-inch high, engraved letters. For equipment designation and ¼-inch letters indicating source circuit designation, (i.e.: “IDF(FCR) XXYY –served from MDF (BCR) XXGG).
   3. Permanent, waterproof, black markers shall be used to identify each communications grid junction box, clearly indicating the type of system available at that junction box.
   4. Pull Boxes: Field work each with a nameplate showing identity, and identifying equipment connected to it. Nameplates shall also indicate where pull box is fed from.
   5. Communication hardware located above accessible ceilings: Provide ½-inch high black name plate with white 1/4-inch letters glued to bottom of t-grid ceiling below hardware located above ceiling. Identification shall be as short as possible yet identifying device above ceiling, i.e. “A/V-EQ”.

E. Prohibited Markings: Markings intended to identify the manufacturer, vendor, or other source from whom the material has been obtained are prohibited for installation in public, tenant, or common areas within the project. Also prohibited are materials or devices that bear evidence that markings or insignias have been removed. Certification, testing (example, Underwriters Laboratories), and approval labels are exceptions to this requirement.

F. Warning Signs: Provide warning signs where there is hazardous exposure associated with access to or operation of communications facilities. Provide text of sufficient size to convey adequate information at each location; mount permanently in an appropriate and effective location. Comply with industry

standards for color and design.

G. Wire and Cable Labeling: Provide wire markers on each conductor in all boxes, pull boxes, gutters, wireways. Identify with drop/circuit number.

H. Underground Warning Tape: Thomas and Betts or approved equal. Six-inch wide plastic tape, colored red or orange with suitable warning legend describing buried communications lines. All underground conduits shall be so identified. Tape shall be buried at a depth of 6-inches below grade and directly above conduits or ductbanks. Provide magnetic marking tape below all underground conduits.

3.6 CUTTING AND PATCHING

A. General: Comply with the requirements of Division 01 for the cutting and patching of other work to accommodate the installation of electrical work. Except as authorized by the Architect / Engineer, cutting and patching of electrical work to accommodate the installation of other work is not permitted.

3.7 INSTRUCTION OF OWNER'S PERSONNEL

A. Before proceeding with the instruction of Owner Personnel, prepare a typed outline in triplicate, listing the subjects that will be covered in this instruction, and submit the outline for review by the Owner. At the conclusion of the instruction period obtain the signature of each person being instructed on each copy of the reviewed outline to signify that he has a proper understanding of the operation and maintenance of the systems and resubmit the signed outlines.

B. Prior to substantial completion, conduct an on-site training program to instruct Owner's operating personnel in the operation and maintenance of the communications systems.
1. Provide the training during regular working day.
2. The Instructors shall be experienced in their phase of operation and maintenance of the systems and with the project.

C. Time to be allocated for instructions.
The Contractor shall furnish the services of factory trained specialists to instruct the Owner's operating personnel. The Owner's operator training shall include training as specified per system specification,
1. Minimum of four (4) hours dedicated instructor time
2. 2-hour sessions on different, non-consecutive days
3. Additional instruction time for specific systems as specified in other Sections.

D. Before on-site training, submit the program syllabus; proposed time and dates; for

review and approval, minimum 48 hours prior to proposed training time and date.
1. One copy to the Owner
2. One copy to the Architect / Engineer

E. The Owner shall provide a list of personnel to receive instructions and shall coordinate their attendance at the agreed upon times.

F. Use operation and maintenance manuals as the basis of instruction. Review manual with personnel in detail. Explain all aspects of operation and maintenance.

G. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shut down of each item of equipment.

H. Demonstrate equipment functions (both individually and as part of the total integrated system).

I. Prepare and insert additional data in the operating and maintenance manuals when the need for additional data becomes apparent during instructions.

J. Submit a report within one week after completion of training. List time and date of each demonstration, hours devoted to the demonstration, and a list of people present, with their respective signatures.

K. At the conclusion of the on-site training program, have the person designated by the Owner sign a certificate to certify that he/she has a proper understanding of the system, that the demonstrations and instructions have been satisfactorily completed, and the scope and content of the operating and maintenance manuals used for the training program are satisfactory.

L. Provide a copy of the report and the certificate in an appropriately tabbed section of each Operating and Maintenance Manual.

3.8 OPENINGS

A. Framed, cast or masonry openings for boxes, equipment or conduits are specified under other divisions. Drawings and layout work for exact size and location of all openings are included under this division.

3.9 OBSTRUCTIONS

A. The drawings indicate certain information pertaining to surface and subsurface obstructions, which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
1. Before any cutting or trenching operations are begun, verify with Owner's

representative, utility companies, municipalities, and other interested parties that all available information has been provided.

2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

B. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

3.10 VANDAL RESISTANT DEVICES

A. Where vandal resistant screws or bolts are employed on the project, deliver to the Owner 2 suitable tools for use with each type of fastener used.

B. Proof of delivery of these items to the Owner shall be included in the Operating and Maintenance Manuals.

3.11 PROTECTION

A. Protect work, equipment, fixtures, and materials. At work completion, work must be clean and in original manufacturer's condition.

B. Do not deliver equipment to this project site until progress of construction has reached the stage where equipment is actually needed or until building is closed in enough to protect the equipment from weather. Equipment allowed to stand in the weather shall be rejected, and the contractor is obligated to furnish new equipment of a like kind at no additional cost to the Owner.

3.12 EQUIPMENT BACKBOARDS

A. Backboards: ¾ inch, fire retardant, exterior grade plywood, painted gray, both sides.

1. Provide minimum of two 4-ft. by 8-ft. sheets of plywood for each location shown.
2. Provide minimum of two 4-ft. by 4-ft. sheets of plywood for each communications location.

3.13 SITE MANAGEMENT RESPONSIBILITY

A. The Contractor shall provide an on-site Project Manager as defined in CONTRACTOR’S QUALIFICATIONS portion of this Section.

3.14 DEMOLITION AND RELOCATION

A. The Contractor shall modify, remove, and relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain as directed by the Owner. Materials and items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to the approval of the Owner. The Contractor may substitute new materials and items of like design and quality in lieu of materials and items to be relocated, if approved by the Owner.

B. All items scheduled for relocation and/or reuse shall be inspected by the Contractor and the Owner or his authorized representative. A written report of the condition of each item shall be made and provided to the Consultant. Where items scheduled for relocation and/or reuse are considered unsuitable for reuse, the Contractor shall so notify the Consultant and await reinstallation instructions before proceeding with removal. Items damaged in reinstallation shall be repaired or replaced by the Contractor as directed by the Owner at no additional cost to the Owner or the Consultant.

C. All items which are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean, repair, and provide all new materials, fittings, and appurtenances required to complete the relocation and to restore the items to good operative order. All relocations shall be performed by workmen skilled in the work ad in accordance with standard practice of the trades involved.

D. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points as indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied off or connections into the existing facilities in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities which must remain in operation during the construction period shall not be interrupted without prior specific written approval of the Consultant.

3.15 EXISTING SYSTEM TESTING

A. Contractor shall have each low voltage system tested prior to the commencement of construction. Systems shall include all systems that fall under the Division 27 umbrellas, as identified in the Division 27 of the Construction Specifications Institute (CSI) current Master Format . Test shall include the functionality of all

field devices and equipment. Any failures or items found to be functioning not to specification, shall be reported prior to construction. Any items found to be improperly or non-functioning upon the completion of the project, shall be replaced and/or repaired, by the contractor, at no additional cost to the project or the owner.

B. Contractor shall document the location and any ID tag, MAC address, IP address, or bar code of any existing device that is to be removed from its current location. Devices that are to remain, shall be reinstalled in the exact location that they reside in prior to construction, unless noted otherwise.

C. Any individual/firm that will be removing, relocating, reinstalling, or tampering with any devices; shall be licensed by the state and certified by the manufacturer of the system.

D. Contractor shall remove any devices where construction occurs to prevent possible damage to the device. Removal of any devices which support user connection or other systems, shall be coordinated with the owner prior to removal and/or taking offline.

3.16 START-UP RESPONSIBILITY

A. The Contractor shall initiate System operation. The Contractor shall provide competent Start-Up personnel on each consecutive working day until all Communications Systems are functional and ready to start the acceptance test phase. If the Contractor, in the Owner / Architect's judgment, is not demonstrating progress in solving any technical problems, the Contractor shall supply Manufacturer's factory technical representation and diagnostic equipment at no cost to the Owner, until resolution of those defined problems. Where appropriate, the Contractor shall bring the Systems on-line in their basic state (i.e., alarm reporting, facility code access control, etc.) It is the responsibility of the Owner to provide the specific database information that will be utilized for initial system programming.

B. Properly ground each piece of electronic equipment prior to applying power. Properly ground all shielded wire shields to the appropriate earth ground at the hub end only, not at the remote or device end.

C. Use a start-up sequence that incrementally brings each portion of the system on-line in a logical order that incorporates checking individual elements before proceeding to subsequent elements until the entire system is operational. The basic steps should include:
   1. Establish ground planes at the equipment rooms and hub end of the systems as specified in Division 26.

2. Disconnect power, connect the first device, reconnect power, and verify operational correctness. Repeat until the entire system is verified and operational.

3.17 PREPARATION FOR ACCEPTANCE (SUBSTANTIAL COMPLETION)

A. All systems, equipment, and devices shall be in full and proper adjustment and operation, and properly labeled and identified.

B. All materials shall be neat, clean and unmarred, and parts securely attached.

C. All extra material as specified shall be delivered and stored at the premises as directed.

D. Test reports of each system and each system's components and As-Built Project Drawings shall be complete and available for inspection and delivery as directed by the Owner.

3.18 SYSTEM ACCEPTANCE REQUIREMENTS

A. Before final acceptance or work, the Contractor shall perform and/or deliver each of the following in the order stated.

B. The Contractor shall deliver three (3) composite "System Operations and Maintenance" manuals in three-ring binders, sized to hold the material below, plus 50% excess. Each manual shall contain in appropriately tabbed sections:
   1. A statement of Guarantee including date of termination and the name and phone number of the persons to be called in the event of equipment failure.
   2. A set of Operating procedures for the overall System that includes all required Owner activities, and that allows for the Owner operation of all attributes and facilities of the System.
   3. A section for each specific type of equipment containing the vendor manuals, instruction sheets, and any related literature that cam in the original shipping container for that piece of equipment. Include all warranty cards.

C. Testing:
   1. The Contractor shall perform all tests required by Division 26 and those submitted as part of this Section.
   2. The Contractor shall activate all devices for proper system operation, including supervisory and trouble circuit tests. Similarly, audible alarms will not be activated except on a one-time, coordinated basis, to check the actual sounding devices.

3. A test report for each piece of equipment shall be prepared by the Contractor and submitted to the Owner. This report shall include a complete listing of every device, the date it was tested, by whom and the results. The final test reports shall indicate that every device tested successfully. Failure to completely test and document the tests will result in a delay of final testing and acceptance.

D. As-Built Drawings:
1. After completion of all the tests listed above, and prior to the final acceptance test, The Contractor shall submit the complete As-Built drawings as identified in PART 1 – PROJECT RECORD DRAWINGS.
2. The final As-Built Drawings shall consist on one set of reproducible prints, two (2) sets of Point-to-Point Detail Drawings, Equipment Schedules, and the complete detailed technical data that was shipped by the manufacturer with all installed equipment.

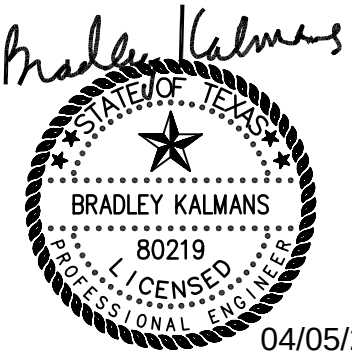
E. Final Acceptance Test: The Final Acceptance Test shall demonstrate the installed and activated System's performance and compliance with System Specifications. However, before this testing can begin the following must have received and reviewed by the Owner.
1. System Operations and Maintenance Manuals
2. System Test Reports
3. As-Built Drawings

3.19 FINAL ACCEPTANCE

A. The date of final acceptance shall be the date of owner occupancy, or the date all punch list items have been completed or final payment has been received. Refer to Division 1 for additional requirements

B. When the Final System Acceptance Requirements described above including the Final Acceptance Test described above have been satisfactorily completed. The Owner / Architect shall issue a Letter of Completion to the Contractor indicating the date of such completion. The Notice of Completion shall be recorded by the Contractor upon receipt of the Owner / Architect completion letter. This date of record shall be the start of the warranty period.

END OF SECTION



04/05/2024

SECTION 27 05 07

COMMUNICATIONS SHOP DRAWINGS, COORDINATION DRAWINGS & PRODUCT DATA

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Prepare submittals as required by Division 01 and as outlined below.

B. Submit product data shop drawings only for the following and for items specifically requested elsewhere in the Contract Drawings and Specifications. Architect / Engineer reserves the right to refuse shop drawings not requested for review and to imply that materials shall be provided as specified without exception.

C. The term submittal, as used herein, refers to all:
1. Shop Drawings
2. Coordination Drawings
3. Product data

D. Submittals shall be prepared and produced for:
1. Distribution as specified
2. Inclusion in the Operating and Maintenance Manual, as specified, in the related section

1.2 SHOP DRAWINGS

A. Present drawings in a clear and thorough manner. Identify details by reference to sheet and detail, schedule, or room numbers shown on Contract Drawings.

B. Show all dimensions of each item of equipment on a single composite Shop Drawing. Do not submit a series of drawings of components.

C. Identify field dimensions; show relation to adjacent or critical features or work or products.

1.3 COORDINATION DRAWINGS

A. Present in a clear and thorough manner. Title each drawing with project name. Identify each element of drawings by reference to sheet number and detail, or room number of contract documents. Minimum drawing scale: 1/4"=1'-0".

B. Prepare coordination drawings to coordinate installations for efficient use of available space, for proper sequence of installation and to resolve conflicts. Coordinate with work specified in other sections and other divisions of the specifications.

C. For each room containing technology equipment and each rack with technology equipment, submit plan and elevation drawings. Show:
   1. Actual technology equipment and components to be furnished.
   2. NEC working space and NEC access to NEC working space.
   3. Relationship to other equipment and components and openings, doors and obstructions
   4. Rack location and dimensions

D. Identify field dimensions. Show relation to adjacent or critical features of work or products.

E. Verify location of communications station devices, telephone outlets and other work specified in this Division.
   1. Coordinate with drawing details, site conditions and millwork shop drawings prior to installation.
   2. Where required for clarification, submit shop drawings prior to rough-in and fabrication.

F. Submit shop drawings in plan, elevation and sections, showing outlets and other devices in casework, cabinetwork and built-in furniture.

1.4 PRODUCT DATA

A. All product options specified shall be indicated on the product data submittal. All options listed on the standard product printed data not clearly identified as not part of the product data submitted shall become part of the Contract and shall be provided.

B. Mark each copy of standard printed data to identify pertinent products, referenced to specification section and article number.

C. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions and required clearances.

D. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the

work. Delete information not applicable.

E. Mark up a copy of the specifications for the product to indicate a) acknowledgement of the specification requirement (Comply), or b) acknowledgement that the particular specification requirement does not apply to this specific project (Not Applicable) or, c) acknowledgement that the specification requirement cannot be made or that a variance is being submitted for review to the Architect / Engineer / Owner (Does Not Comply, Explanation:)

1.5 MANUFACTURERS INSTRUCTIONS

A. Submit Manufacturer's instructions for storage, preparation, assembly, installation, start-up and adjusting.

1.6 CONTRACTOR RESPONSIBILITIES

A. Review submittals prior to transmittal.

B. Determine and verify:
1. Field measurements
2. Field construction criteria
3. Manufacturer's catalog numbers
4. Conformance with requirements of Contract Documents

C. Coordinate submittals with requirements of the work and of the Contract Documents.

D. Notify the Architect / Engineer in writing at time of submission of any deviations in the submittals from requirements of the Contract Documents.

E. Do not fabricate products, or begin work for which submittals are specified, until such submittals have been produced and bear contractor's stamp. Do not fabricate products or begin work scheduled to have submittals reviewed until return of reviewed submittals with Architect / Engineer's acceptance.

F. Contractor's responsibility for errors and omissions in submittals is not relieved whether Architect / Engineer reviews submittals or not.

G. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved whether Architect / Engineer reviews submittals or not, unless Architect / Engineer gives written acceptance of the specific deviations on reviewed documents.

H. Submittals shall show sufficient data to indicate complete compliance with Contract Documents:
   1. Proper sizes and capacities
   2. That the item will fit in the available space in a manner that will allow proper service
   3. Construction methods, materials and finishes

I. Schedule submissions at least 15 days before date reviewed submittals will be needed.

1.7 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Project or in the work of any other Contractor.

B. Number of submittals required:
   1. Shop Drawings and Coordination Drawings: Submit four opaque reproductions.
   2. Product Data: Submit the number of copies the contractor requires, plus those to be retained by the Architect / Engineer.

C. Accompany submittals with transmittal letter, in duplicate, containing:
   1. Date
   2. Project title and number
   3. Contractor's name, address and telephone number
   4. The number of each Shop Drawing, Project Datum and Sample submitted
   5. Other pertinent data

D. Submittals shall include:
   1. The date of submission
   2. The project title and number
   3. Contract Identification
   4. The names of:
      a. Contractor
      b. Subcontractor
      c. Supplier
      d. Manufacturer
   5. Identification of the product
   6. Field dimensions, clearly identified as such
   7. Relation to adjacent or critical features of the work or materials
   8. Applicable standards, such as ASTM or federal specifications numbers
   9. Identification of deviations from contract documents

10. Suitable blank space for General Contractor and Architect / Engineer stamps
11. Contractor's signed and dated Stamp of Approval

E. Coordinate submittals into logical groupings to facilitate interrelation of the several items.
   1. Finishes which involve Architect / Engineer selection of colors, textures or patterns
   2. Associated items requiring correlation for efficient function or for installation

1.8 SUBMITTAL SPECIFICATION INFORMATION

A. Every submittal document shall bear the following information as used in the project manual:
   1. The related specification section number
   2. The exact specification section title

B. Submittals delivered to the Architect / Engineer without the specified information will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.9 RESUBMISSION REQUIREMENTS

A. Make resubmittals under procedures specified for initial submittals.
   1. Indicate that the document or sample is a resubmittal
   2. Identify changes made since previous submittals

B. Indicate any changes which have been made other than those requested by the Architect / Engineer.

1.10 CONTRACTOR'S STAMP OF APPROVAL

A. Contractor shall stamp and sign each document certifying to the review of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

B. Contractor's stamp of approval on any submittal shall constitute a representation to Owner and Architect / Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each submittal with the requirements of

the work and the Contract Documents.

C. Do not deliver any submittals to the Architect / Engineer that do not bear the Contractor's stamp of approval and signature.

D. Submittals delivered to the Architect / Engineer without Contractor's stamp of approval and signature will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.11 ARCHITECT / ENGINEER REVIEW OF IDENTIFIED SUBMITTALS

A. The Architect / Engineer will:
1. Review identified submittals with reasonable promptness and in accordance with schedule. Specific equipment submittals that may be required to be expedited shall be submitted separately without other submittal items not requiring the same prompt attention.
2. Affix stamp and initials or signature, and indicate requirements for resubmittal or approval of submittal
3. Return submittals to Contractor for distribution or for resubmission

B. Review of submittals will not extend to design data reflected in submittals that is peculiarly within the special expertise of the Contractor or any party dealing directly with the Contractor.

C. Architect / Engineer's review is only for conformance with the design concept of the project and for compliance with the information given in the contract.
1. The review shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
2. The review shall not extend to review of quantities, dimensions, weights or gauges, fabrication processes or coordination with the work of other trades.

D. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

1.12 SUBSTITUTIONS

A. Do not make requests for substitution employing the procedures of this Section.

B. The procedure for making a formal request for substitution is specified in Division 1.

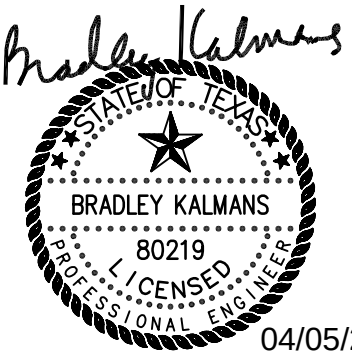
PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 SHOP DRAWINGS AND PRODUCT DATA

A. Submittals shall not be combined or bound together with any other material submittal.

B. Submit individually bound shop drawings and product data for the following when specified or provided:
1. Structural Cabling
2. Communications System
3. Sound Reinforcement System
4. CATV System



3.2 COORDINATION DRAWINGS

A. Submit coordination drawings as specified.

END OF SECTION

Doc.
No. **Document Title**

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BIDDING REQUIREMENTS

INSTRUCTIONS TO BIDDERS

BID FORMS AND SUPPLEMENTS (NOTE: TO BE PROVIDED WITH BID)

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GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 14 08 00 Commissioning of Conveyance Systems

B. Section 26 08 00 Commissioning of Electrical Systems

1.2 SUMMARY

A. The Commissioning Process (Cx) is a quality-focused process for enhancing the delivery of a project. Cx focuses on evaluating and documenting that all the commissioned systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's Project Requirements (OPR). For the purposes of this project, the OPR is defined as the HAS Design Standards, current version as of the date of this executed contract, and the programming deliverable provided by the AE consultant.

B. Cx roles and responsibilities for each Project Delivery Team (PDT) member involved are defined in Sections 1.9 (Cx Team), 1.10 (Contractor) and 1.11 (CxA). Special responsibilities are included in the commissioning requirements section by division, where applicable.

C. Cx does not dilute the responsibility of the designers or installing contractors to provide a finished and fully functioning product.

D. Systems to be commissioned are listed in Section 1.5.

1.3 COORDINATION

A. Commissioning Authority (CxA): the CxA is the individual that is responsible for the management of actions and generation of deliverables as outlined in the Cx Plan.

B. Commissioning Provider (CxP): the CxP may comprise several companies, including subcontractors to the CxA who act as the contract to the Owner.

C. Management: The CxA works for the Commissioning Manager (CxM)/Owner. The CxA directs and coordinates the project Cx Activities and reports the CxM/Owner and/or the Owner's Representative (O-REP). Team members work together to fulfill their contracted responsibilities and meet the objectives of the contract documents. The organization chart in Figure 1 clarifies the roles:

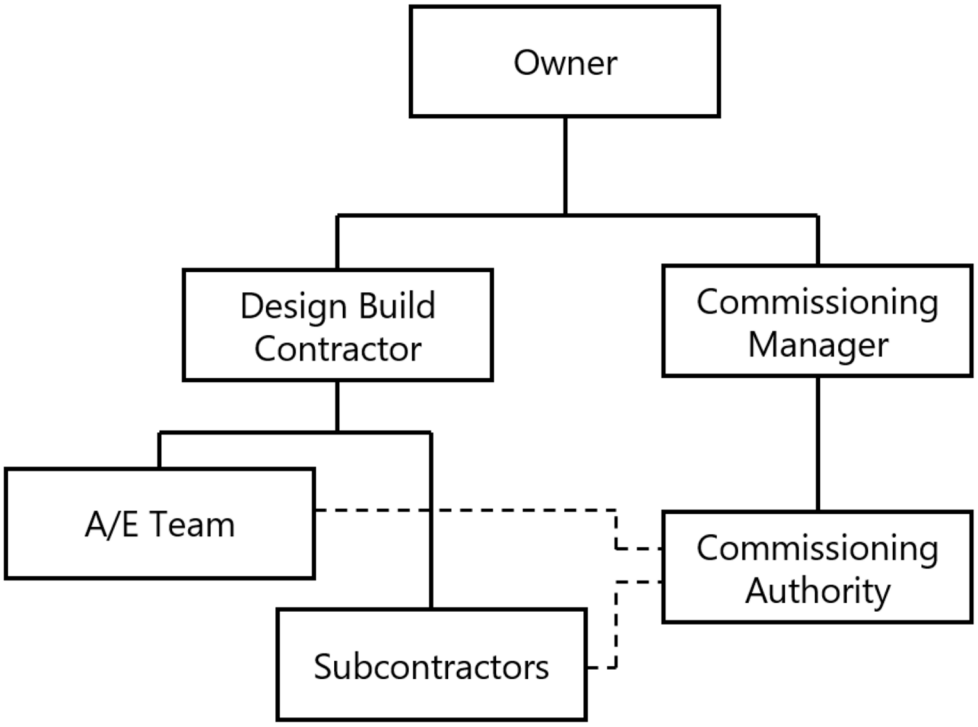


Figure 1. Organization Chart

1.4 COMMISSIONING PROCESS

A. Cx activities shall begin in the design phase of the project but will initiate with the Cx Team that includes the Contractor during pre-construction with submittal reviews. The CxA shall distribute a Cx Plan that includes pre-functional and functional performance test procedures. As part of the startup procedures, the Contractor shall perform pre-functional testing and complete the web-based documentation in Facility Grid, or other designated system. The pre-verification testing will be completed by the Contractor(s) before functional performance testing begins, to ensure that ALL systems and equipment are ready for successful testing. The CxA shall witness the functional performance testing with the Contractor running each test and provide necessary support for completion of the procedures.

1.5 SYSTEMS TO BE COMMISSIONED

A. Commission the following systems and assemblies:
   1. Conveyance Systems
   2. Electrical Systems

1.6 REFERENCES

A. The publications listed below form a part of this specification to extent referenced.
   1. AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR-CONDITIONING ENGINEERS (ASHRAE)
      a. ASHRAE Standard 202 (2018) Commissioning Process for Buildings and Systems
      b. ASHRAE Guideline 1.1 (2007) HVAC&R Technical Requirements for the Commissioning Process, with errata published July 2, 2012
   2. INTERNATIONAL CODE COUNCIL
      a. IECC – International Energy Conservation Code (2021)
   3. BUILDING COMMISSIONING ASSOCIATION
      a. New Construction Commissioning, Best Practices (2018)
   4. ASTM INTERNATIONAL:
      a. ANSI/ASTM E2947-21A (2021). Standard Guide for Building Enclosure Commissioning

1.7 DEFINITIONS

A. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, supporting information, and operations and maintenance requirements.

B. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

C. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

D. Test Checklists: CxA shall develop test checklists for each system, subsystem, or equipment including interfaces and interlocks, and include a separate entry, with space for comments, for each item to be tested.

F. Certificate of Readiness: Certificate of Readiness shall be signed by the General Contractor, Subcontractor(s) certifying that systems, subsystems, equipment, and associated controls are ready for testing. Completed test checklists signed by the responsible parties shall accompany this certificate

G. Test and Inspection Reporting: Subcontractors shall perform Pre-Functional Tests (provided by CxA), shall complete the Pre-Functional Test documentation (PFCs), and report all activities and progress in the cloud-based reporting tool (Facility Grid). Subcontractors shall perform Pre-Verification Testing based on Functional Test scripts provided by the CxA. The Subcontractors will then execute the Functional Performance Tests, which shall be witnessed by the CxA. The CxA shall complete the Functional Testing documentation, including observed issues, in Facility Grid.

H. Corrective Action Documents: CxA shall document, in Facility Grid, ALL corrective action taken for systems and equipment that fail functional tests. Include required modifications to systems and equipment and revisions to test procedures, if any. Retest systems and equipment requiring corrective action and document retest results in Facility Grid.

I. Commissioning Report: CxA shall document results of the commissioning process including unresolved issues and performance of systems, subsystems, and equipment. The commissioning report shall indicate whether systems, subsystems, and equipment have been completed and are performing according to the OPR, BOD, and Contract Documents.

J. Commissioning Manager (CxM): The entity identified by the owner who ensures the commissioning process is executed by the CxA.

K. Commissioning Authority (CxA): The entity identified by the owner who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process.

L. General Contractor: The prime construction contractor, whether in a Bid/Build General Contractor role, a CMAR role, or a Design-Build prime role. The abbreviation GC shall denote any firm serving in the role of the construction prime contractor.

M. Sub-Contractors: Contracted directly or indirectly to GC. Responsible for certain trade installations and related installation coordination with other trades.

N. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.8 COMMISSIONING SOFTWARE FACILITY GRID

A. The commissioning process relies upon tracking, documenting, and reporting of activities and milestones that have a critical impact on the project schedule. Communication between the Project Delivery Team members (Owner, CxM, Architect, Engineer, Constructor, Subs) is critical to recognizing potential issues in the commissioning process. This section addresses the use of commissioning software to facilitate tracking and reporting of the commissioning process.

1. The CxA utilizes cloud-based software (Facility Grid) as a commissioning process management application reporting tool. As such, the CxA shall use Facility Grid to facilitate the Commissioning Process. Facility Grid will be used to manage Commissioning activities including but not limited to: Recording site observations, generating and completing PFCs and FPTs, tracking Commissioning issues and deficiencies, developing the Final Commissioning Report and the Systems Manual.
2. The Facility Grid software license will be provided by the CxA at no cost to the project participants. The CxA will provide the training at no cost to the project participants as required for effective use of the software.
3. The Contractors that have been awarded this project will be required to use Facility Grid for the purpose of completion of PFCs, PVTs, and for responding to Commissioning Issues.

1.9 COMMISSIONING TEAM

A. Members appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of the General Contractor, Mechanical subcontractors, Electrical subcontractors, BAS subcontractors, suppliers, and specialists deemed appropriate by the CxA.

B. Members appointed by Owner:
1. CxM: The commissioning manager within the owner's organization, assigned to ensure successful completion of the commissioning process by the CxA.
2. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
3. Representatives of the facility user and operation and maintenance personnel.
4. Architect and engineering design professionals.

1.10 CONTRACTOR'S RESPONSIBILITIES

A. Provide utility services required for the commissioning process.

B. Contractor shall assign representatives with expertise and authority to act on behalf of the Contractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
1. Participate in construction phase coordination meetings.
2. Participate in maintenance orientation and inspection.
3. Develop and participate in operation and maintenance training sessions.
4. Participate in final review at acceptance meeting.
5. Furnish a copy of all construction documents, addenda, change orders, submittals and shop drawings related to commissioned equipment ~~to~~ the Cx Plan.
6. Furnish a copy of documents required to compile the Facility Requirements and Operations and Maintenance Plan including but not limited to:

a. Sequences of operation for the building
b. Building occupancy schedule
c. Equipment run-time schedules
d. Setpoints for all HVAC equipment
e. Lighting levels throughout the building
f. Minimum outside air requirements
g. Changes in schedules or setpoints for different seasons, days of the week, and times of day
h. Systems narrative describing the mechanical and electrical systems and equipment
i. Preventive maintenance plan for building equipment described in the systems narrative

7. Certify that Work is complete:
   a. Provide completed manufacturer start-up documents.
   b. Complete pre-functional checklists, issued by the CxA.
   c. Complete pre-verification tests, issued by the CxA.
   d. Include calibration of instrumentation and controls.
   e. Provide required trend data for applicable systems.
8. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
9. Review and accept Cx test procedures provided by the CxA.
10. Perform Cx test procedures, witnessed by the CxA.
11. Perform opposite season testing, witnessed by the CxA.
12. Attend warranty walk through with Cx Team at approximately 10 months from date of substantial completion, and address any deficiencies identified that are in-Contract by the AE or the CxA.

C. Subcontractors shall assign representatives with expertise and authority to act on behalf of subcontractors and schedule them to participate in and perform Cx Team activities including, but not limited to, the following:
1. Participate in construction phase coordination meetings.
2. Participate in maintenance orientation and inspection.
3. Participate in procedures meeting for testing.
4. Participate in final review at acceptance meeting.
5. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to CxA for incorporation into the Cx Plan. Update schedule throughout the construction period.
6. Provide information to the CxA for developing construction phase Cx Plan.
7. Participate in training sessions for Owner's operation and maintenance personnel.
8. Provide updated Project Record Documents to the CxA.
9. Gather and submit operation and maintenance data for systems, subsystems, and equipment to the CxA.

10. Provide technicians who are familiar with the construction and operation of installed systems and who shall participate in testing of installed systems, subsystems, and equipment.
11. Certify in writing that Work is complete and ready for Functional Testing:
    a. Provide completed manufacturer start-up documents.
    b. Complete pre-functional checklists, issued by the CxA.
    c. Complete pre-verification tests, issued by the CxA.
    d. Include calibration of instrumentation and controls.
    e. Provide required trend data for applicable systems.

1.11 CXA'S RESPONSIBILITIES

A. Develop the Cx Plan.

B. Host Cx kickoff meeting.

C. Review select project equipment submittals concurrently with the AE to confirm conformance with the OPR, or identify where deviations exist. Utilize information in approved submittals to complete development of the PFCs. PVTs, FPTs, and ISTs.

D. Provide Project-specific construction checklists and Cx test procedures (PFCs, PVTs, FPTs, and ISTs).

E. Conduct periodic site visits and report site observations to ensure the installation meets project requirements.

F. Verify the execution of Cx activities at a random selection sampling rate described in the commissioning section of each applicable system specifications. The sampling rate may vary from 1 to 100 percent, as determined by the CxM. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log. The issues created under the random sampling protocol will apply as "typical" to all of the same equipment type.

G. Prepare and maintain the Issues Log in Facility Grid.

H. Prepare and maintain completed construction checklist log in Facility Grid.

I. Witness systems, assemblies, equipment, and component startup in a manner that encourages the installing contractors to follow the project's quality assurance plan.

J. Compile third party test data, BSG inspection reports, and certificates of readiness; include them in the systems manual and Cx Report.

K. Witness seasonal testing and lead Cx Team in end of warranty walk through.

1.12 RE-TESTING

A. Abort Functional Performance Tests, Integrated Systems Tests, or Seasonal Tests if any deficiency prevents successful completion of the test or if any required Cx Team member is not present for the test. Re-test only after all deficiencies identified during the original tests have been corrected. Re-testing will occur at the direction of the CxM and will be paid for with a deductive change order against the responsible party's contract. The decision to abort scheduled tests will be the responsibility of the CxA and the CxM.

B. Systems or equipment, for which 100 percent sample size are tested, fail if one or more of the test procedures results in discovery of a deficiency during the test that prevents completion of the test. Re-test to the extent necessary to confirm that the deficiencies have been corrected without negatively impacting the performance of the rest of the system. Re-testing will occur at the direction of the CxM and will be paid for with a deductive change order against the responsible party's contract. The decision to fail scheduled tests will be the responsibility of the CxA.

C. For systems tests with a sample size less than 100 percent, if one or more of the test procedures for an item of equipment or a system results in discovery of a deficiency, regardless of whether the deficiency is corrected during the sample tests, the item of equipment or system fails the test.
   1. If the system failure rate is 5 percent or less, meaning that 5 percent or less of the equipment or systems had at least one deficiency, re-test only on the items which experienced the initial failures.
   2. If the system failure rate is higher than 5 percent, meaning that more than 5 percent of equipment or systems tested had at least one deficiency, re-test the items which experienced the initial failures to the extent necessary to confirm that the deficiencies have been corrected. In addition, test another random sample of the same size as the initial sample for the first time. If the second random sample set has any failures, re-test those failed items and all remaining equipment and systems to complete 100 percent testing of that system type.

D. If re-testing is required due to failed functional performance tests, the contractor is responsible for coordinating with necessary team members and adjusting the overall project schedule to accommodate the re-testing. The Contractor is also responsible for reimbursing any costs associated with factory representative and Cx Team members participation during re-retests. Payment for additional services by the CxA associated with re-testing will be accomplished through deductive change orders against the Prime Contractor. The Owner will review and approve requests for additional services related to re-testing.

E. If retesting is required, the contractor shall provide the CxA with ~~3~~ business days advanced notice for a test duration of less than 24 hours. For tests with duration of greater than 24 hours, advanced notice of 10 business days is required. The CxA shall not be held responsible for project delivery delays due to rescheduled tests to complete the Cx activities.

1.13 QUALITY ASSURANCE

A. Instructor Qualifications: Factory-authorized service representatives experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.
   1. Test Equipment Calibration: Comply with test equipment manufacturer's calibration procedures and intervals. Provide current verification of calibration, in writing, prior to beginning and testing. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

1.14 COORDINATION

A. Coordinating Meetings: The Contractor shall conduct the following coordination meetings with the Cx Team.
   1. Cx kick-off meeting.
   2. Submittal review meetings, as required.
   3. Construction progress meetings.
   4. BAS trends requirements meeting.
   5. Pre-test meetings.
   6. Cx issue resolution meetings, if determined necessary by the CxA.
   7. Any additional meetings deemed necessary to adequately perform Cx duties and functions.

B. Testing Coordination: The Contractor shall coordinate, with the Cx Team, the schedule of functional performance testing, as identified in the Cx plan.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities

PART 2 - PRODUCTS

2.1 MATERIALS

A. The contractor provides their own respective tools, instruments, and consumables required to meet the requirements of the Cx as described in this section and related sections.

PART 3 - EXECUTION

3.1 Special execution of the Cx activities shall be defined in the technical commissioning specification for each applicable discipline.
   1.

3.2 COMMISSIONING TESTS

A. This subsection applies to Cx testing for all related divisions in ~~this section~~.

B. The contractor shall be responsible to fully execute testing of equipment, systems, and assemblies according to the specifications.

C. Pre-functional checklist will include requirements that Contractor:
   1. Provide BAS point to point report for each applicable system. The CxA requires this documentation be uploaded to Facility Grid.
   2. Pre-test all sequences of operation using the Pre-Verification Test on Facility Grid. The PVT is a version of the FPT completed by the Contractor.

D. Functional performance testing can only initiate after approval by CxA that the pre-functional checklists, pre-verification testing, and Test and Balance is complete. The Contractor shall provide the CxA with a minimum of 5 business days to review the PFCs, PVTs, and trend data, as well as a walk through onsite before scheduling the FPTs. The Contractor shall notify the CxA directly that the PFCs and PVTs are complete and trend data is ready for review by the CxA.

E. Test procedure format: A sample test form is provided in the Cx Plan. The test procedure forms developed by the CxA shall include, but not be limited to, the following information:

F. Problem solving: The burden of problem solving is on the Contractor, Engineer and the Architect, though the CxA may recommend solutions to problems found.

G. Functional performance test results: The CxA is responsible for determining the following results for each functional performance test they witness:
   1. Nonconformance
   2. Failure due to manufacturer defect
   3. Approval and acceptance

H. Deferred testing may be required by the CxA to address seasonal conditions that may prohibit a required test, or to accommodate changes in the project schedule. All such deferred testing requirements shall be coordinated with the Construction schedule and submitted for PDT and Cx Team review and acceptance.
   1.

3.3 TRAINING OF OWNER'S PERSONNEL

A. The CxA shall confirm the owner's personnel receives adequate training, administered by the appropriate contractors or manufacturer representatives, in accordance with the training requirements set in these contract documents. The contractors shall submit a training matrix to the CxA that includes proposed dates, methods of training, systems or equipment to be covered, agenda of topics to be covered, and the trainer's qualifications. The contractor should also video record each training session, as required by the owner

in the Owner's Project Requirements. The training matrix shall be provided the to the CxA no later than 30 days prior to the proposed training dates. Upon completion of each training session, a copy of the video recording shall be provided to the CxA for confirmation of completion.

END OF SECTION

SECTION 14 08 00
COMMISSIONING OF CONVEYANCE SYSTEMS

PART 1 - GENERAL

1.1 COMISSIONING

A. Review procedure shall apply for escalators, moving walks, individual elevators, portions of groups of elevators, and completed escalators, moving walks, groups of elevators accepted on an interim basis, or escalators, moving walks, elevators and groups of elevators completed, accepted, and placed in operation.

B. Contractor shall perform review and evaluation of all aspects of its work prior to requesting Commissioning Agent's final review. Work shall be considered ready for Commissioning Agent's final contract compliance review when all Contractor's tests are complete, all deficiencies noted by the AHJ have been rectified, and all elements of work or a designated portion thereof are in place and elevator or group of elevators are deemed ready for service as intended.

C. Furnish labor, materials, and equipment necessary for Commissioning Agent's review. Notify Consultant five working days in advance when ready for final review of escalators, moving walks, elevator or group of elevators.

D. Commissioning Agent's written list of observed deficiencies of materials, equipment, and operating systems will be submitted to Contractor for corrective action. Commissioning Agent's review shall include as a minimum:
   1. Workmanship and equipment compliance with Contract Documents.
   2. Contract speed, capacity, floor-to-floor times, and door performance compliance with Contract Documents.
   3. Performance of following is satisfactory:
      a. Speed of units.
      b. Starting, accelerating, running.
      c. Decelerating, stopping accuracy.
      d. Door operation and closing force.
      e. Equipment noise levels.
      f. Signal fixture utility.
      g. Overall ride quality.
      h. Handrail speed and operation.
      i. Performance of door control devices.
      j. Operations of emergency two-way communication device.
      k. Operations of firefighters' service.
      l. Operations of special security features and floor lock-off provisions.
      m. Operations of remote monitoring devices.
      n. Operations of emergency brake device.
   4. Test Results:
      a. In all test conditions, obtain specified contract speed, performance times, stopping accuracy without re-leveling, and ride quality to satisfaction of Purchaser and Commissioning Agent. Tests will be conducted under both no load and full load condition.

E. Performance Guarantee: Should Commissioning Agent's review identify defects, poor workmanship, variance, or noncompliance with requirements of specified codes and/or ordinances, or variance or noncompliance with the requirements of Contract Documents, Contractor shall complete corrective work in an expedient manner to satisfaction of Purchaser and Commissioning Agent at no cost as follows:

1. Replace equipment which does not meet code or Contract Document requirements.
2. Perform work and furnish labor, materials, and equipment necessary to meet specified operation and performance.
3. Perform retesting required by governing code authority, Purchaser, and Commissioning Agent.

F. A follow-up final contract compliance review shall be performed by Commissioning Agent after notification by Contractor that all deficiencies have been corrected. Provide Commissioning Agent with copies of the initial deficiency report marked to indicate items which Contractor considers complete.

END OF SECTION

SECTION 143100 **Revised**

TABLE OF CONTENTS

SECTION 14310

ESCALATOR

PART 1 - GENERAL

1.1 WORK INCLUDED: ESCALATOR ALTERATION, TRUSS RETENTION METHOD

A. Escalators as follows:
   1. Escalator Width:
      a. Escalators DE 8, 9, 13, 15, 16, 17: 48" Wide (40" step).
   2. Escalator Balustrade:
      a. Escalators DE 8, 9, 13, 15, 16, 17: Metal, High Deck.

B. All units shall be of the Public Transportation type; designed to operate under heavy load conditions, 1 person per step, every step 24 continuous hours, 7 day per week environment. Demolition and disposal of all interior components, exclusive of the truss, and installation of new components.

C. All engineering, equipment, labor, inspections and permits required to satisfactorily complete escalator alteration required by Contract Documents.

D. Applicable conditions of General, Special, and Supplemental Conditions, Division 1, and all sections listed in Contract Documents "Table of Contents."

E. Preventive maintenance as described in Part 1.7 B. below. Warranty maintenance.

F. Cartage and Hoisting: All required staging, hoisting and movement to, on and from the site including new equipment, reused equipment, or dismantling and removal of existing equipment.

G. Unless specifically identified as "Reuse," "Retain," or "Refurbish," provide new equipment, parts, assemblies and all related components.

H. Protective barriers between units in normal operation and adjacent units in the modernization process. Protect full wellway. Patch and finish around landing plates.

I. Wellway, and pit/machine area barricades as required.

J. Protect truss, steps, landing plates, handrails and specific metal finishes.

1.2 RELATED WORK

A. Contractor shall be responsible for coordination and completion of any and all work required in the areas surrounding or impacted by the escalator work. The Contractor shall submit with their proposal details of impact to areas near the escalators. Time required to restrict the adjacent areas from any public access shall be noted. Details of proposed approach to the modernization shall also be submitted.

B. During Demolition of existing escalator components and installation of new components provide:
   1. A clear entry and exit safety zone at the top and bottom of the escalators.
   2. Secure work and storage areas adjacent to the escalators.

3. Cut back for all areas where escalators are connected to existing surfaces and rebuilt to match existing.
4. Protect open wellways and all equipment during construction per OSHA Regulations. Provide and maintain all barricades required.
5. Temporary barricades which shall remain in place throughout the demolition and installation process. Remove barricades upon completion of the work.
6. Floor protection to disburse the weight of materials being removed and/or brought into the facility. Floor protection shall be adequate to prevent damage to existing flooring.
7. Provide and install clear path way to remove materials from the building and to bring new materials into the building.
8. Build back surfaces and or building areas to match pre-existing finishes.
9. Any equipment necessary to remove existing and install new components.

C. Wellway and Pit
1. Reuse existing wellway and truss. Clean and paint all areas of the truss with three coats of approved corrosion resistant paint.
2. Reuse existing floor pockets and/or structural beams for support of escalator truss at each end. Any modifications must be completed by Contractor. Include verification by structural engineer and stamped drawings for any structural revisions.
3. Patching and finishing around escalator landing plates, frames, and adjacent flooring after installation.
4. Cladding and finishing of exposed truss surfaces.
5. Protect escalator truss, steps, landing plates, balustrades, handrails, and special metal finishes from damage.
6. Structural engineering calculations and submittals with signed and stamped drawings.
7. Structural welding with written certifications.
8. Adequate lighting for the escalator entry and exit points as well as the incline.

1.3 DEFINITIONS

A. Terms used are defined in the latest edition of the Safety Code for Elevators and Escalators, ASME A17.1.

B. Reference to a device or a part of the equipment applies to the number of devices or parts required to complete the installation.

C. Provisions of this specification are applicable to all escalators unless identified otherwise.

1.4 SOURCE QUALITY CONTROL

A. Source Limitations:
1. Obtain vertical and horizontal equipment, including escalators, specified in another Division 14 Section from single manufacturer.

B. Buy American Requirements:
1. The Contractor shall comply with the applicable FAA Buy American Preference requirements set forth in Title 49 of the United States Code 50101, BABA and other related Made in America Laws, US statutes, guidance, and FAA Policies which provide that federal funds may not be obligated unless all iron, steel, and manufactured goods used in AIP funded projects are produced in the United States, unless the Federal Aviation Administration has issued a waiver for the product; the product is listed as an Excepted Article, Material Or Supply in Federal Acquisition Regulation subpart 25.108; or is included in the FAA Nationwide Buy American Waivers Issued list. If the

contractor procures any capital items with Federal funds it is the Contractors responsibility to obtain the Buy America certification under such regulations.

1.5 QUALITY ASSURANCE

A. Approved Contractors:
   1. Escalators: KONE, TKElevator, Schindler,

B. Compliance with Regulatory Agencies: Comply with most stringent applicable provisions of following Codes, laws, and/or Authorities, including revisions and changes in effect;
   1. Safety Code for Elevators and Escalators, ASME A17.1, most 2008 issue or newer, whichever is more stringent including current editions not adopted by local AHJ
   2. Guide for Inspection of Elevators, Escalators, and Moving Walks, ASME A17.2
   3. Elevator and Escalator Electrical Equipment, ASME A17.5
   4. National Electrical Code, NFPA 70
   5. Americans with Disabilities Act, ADA
   6. Local Fire Authority
   7. Requirements of IBC, and all other Codes, Ordinances and Laws applicable within the governing jurisdiction
   8. Life Safety Code and NFPA 101.

C. Warranty:
   1. Material and workmanship of installation shall comply in every respect with Contract Documents. Correct/replace t defective material or workmanship which develops within one year from date of final acceptance of all work. Perform maintenance in accordance with terms and conditions indicated in the Owner's Preventive Maintenance Agreement.
   2. Defective is defined to include, but not limited to; operation or control system failures, unit is performing below required minimum, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unsatisfactory conditions.
   3. Retained Equipment: All retained components, parts, and materials shall be cleaned, checked, modified, repaired or replaced, so each component and its parts are in like new operating condition. Retained equipment must be compatible for integration with new systems. All retained equipment shall be covered under the warranty provision. Make modifications, requirements, adjustments and improvements to meet performance requirements.
   4. Provide attic stock and other materials as required, delivering and storing usable-but-otherwise-uninstalled materials, attic stock, required spares, and other items as instructed by the Architect. Finishes Binders, tubs, and storage boxes for stored materials shall be labeled, using the specifications numbering system indicated for that material in the Construction Documents. Consistent with that labeling, Contractor shall create and provide to the Owner an MS Excel spreadsheet inventory of attic stock and other materials, indicating product name, applicable specification section, quantity of contents, and locations of its use.
      a. Six (6) complete new steps per escalator.
      b. Three (3) complete sets of comb segments per escalator.

1.6 DOCUMENT AND SITE VERIFICATION

A. In order to discover and resolve conflicts or lack of definition which might create problems, Contractor must review Contract Documents and site conditions for compatibility with its product prior to submittal of quotation. Review existing structure, electrical and mechanical provisions for compatibility with Contractor’s products. Purchaser will not pay for change to structural, mechanical, electrical, or other systems required to accommodate new or modified equipment.

1.7 SUBMITTALS

A. Within 10 calendar days after award of contract and before beginning equipment fabrication, submit shop drawings and required materials for review as outlined in Division I. Allow 30 calendar days for response to initial submittal.
   1. Scaled and Fully Dimensioned Layout: Plan of pits, wellway and machine space indicating equipment arrangement, and section of wellway.
   2. Design Information: Indicate equipment lists, reactions, and design information on layouts.
   3. Power Confirmation Information: Include motor horsepower, code letter, starting current, full-load running current, and demand factor.
   4. Fixtures: Cuts, samples, or shop drawings.
   5. Finish Material: Submit 3" x 12" samples of actual finished material for Architect review of color, pattern, and texture. Compliance with other requirements is the exclusive responsibility of the Provider. Include, if requested, graphics and details of mounting provisions.

B. Acknowledge and/or respond to review comments within 14 calendar days of return. Promptly incorporate required changes due to inaccurate data or incomplete definition so that delivery and installation schedules are not affected. Provider's revision response time is not justification for equipment delivery or installation delay.

1.8 MAINTENANCE

A. All maintenance is to be performed under the terms and conditions of the Owner's Maintenance Agreement.

B. Warranty Maintenance
   1. Provide preventive maintenance and 24-hour emergency callback service for one year commencing on date of final acceptance by Purchaser. Systematically examine, adjust, clean, and lubricate all equipment. Repair or replace defective parts using parts produced by the manufacturer of installed equipment. Maintain escalator machine room, wellway, and pit in clean condition.
   2. Use competent personnel, acceptable to the Purchaser, supervised and employed by Contractor.
   3. Purchaser retains the option to delete cost of warranty maintenance from equipment contract and remit twelve (12) equal installments directly to Contractor during period in which maintenance is being performed.

1.9 PERMIT, TEST AND INSPECTION

A. Obtain and pay for permit, license, and inspection fee necessary to complete installation.

B. Perform test required by Governing Authority in accordance with procedure described in ASME A17.2 Guide for Inspection of Elevators, Escalators, and Moving Walks in the presence of Authorized Representative.

C. Supply personnel and equipment for test and final review by Consultant, as required in Part 3.7 below.

PART 2 - PRODUCTS

2.1 SUMMARY

A. Description:
   1. Type: Public Transportation design

2. Speed: 100 fpm
   a. Rise: Escalators DE 8, 9: 14'-0" ±. Field verify.
   b. Escalators DE 13, 15, 16: 10'-0" ±. Field verify.
   c. Escalator DE 17: 11'-0" ±. Field verify.
3. Operational control: New microprocessor controller;
4. Drive motor gear box: Worm, planetary or helical
5. Balustrades: new; Satin finish stainless steel.
6. Decks: New; provide 14-gauge stainless steel metal, Manufacturer's standard
7. Newel ends: New
8. Molding and trim: New
9. Skirt panels: New; match deck material and finish with low friction application or provide black low friction material applied to metal panels
10. Handrails: New black
11. Step tread and riser: New; Painted Black complete steps including cast body, steps and step rollers; with perimeter demarcation strips.
12. Power supply: Field verify; all equipment must be compatible with existing building systems
13. Step chains: New lubrication free
14. Turn around tracks: New; tracks and new turnarounds
15. Handrail drive chain and sprockets: New
16. Handrail guide: New
17. Combplates: New, yellow segments

B. Additional new features and devices:
   1. Emergency stop buttons: New
   2. Caution signs at each landing: New
   3. Design must be adaptable and compatible with existing truss; modifications to the truss or wellway shall be the responsibility of the contractor and be included in the bid proposal.

C. New safety devices:
   1. Handrail speed monitoring devices
   2. Handrail entry guards
   3. Handrail entry stop switches
   4. Stopped handrail device
   5. Combplate-step impact device
   6. Level step monitoring device
   7. Lateral step displacement device
   8. Step chain tension device
   9. Missing step device
   10. Broken drive chain device
   11. Skirt obstruction device
   12. Variable Speed/passenger approach detection
   13. New stop switch: integral with newel

D. Key direction start switch: New; integral with handrail inlet plate.

E. Signage: New; fasten with tamper-resistant screws. No stick-on or riveted plates. Add signage, “No wheeled carts or strollers on escalators.”

F. Demarcation lighting: New; LED type, top and bottom

G. Fault Display: New; mount on inner deck.

2.2 MATERIALS

A. Steel
1. Sheet Steel (Furniture Steel for Exposed Work): Stretcher-leveled, cold-rolled, commercial quality carbon steel, complying with ASTM A366, matte finish.
2. Sheet Steel (for Unexposed Work): Hot-rolled, commercial quality carbon steel, pickled and oiled, complying with ASTM A568/A568 M-03.
3. Structural Steel Shapes and Plates: ASTM A36.

B. Stainless Steel: Type 304 complying with ASTM A240, with standard tempers and hardness required for fabrication, strength and durability. Apply mechanical finish on fabricated work in the locations shown or specified, (Federal Standard and NAAMM nomenclature), with texture and reflectivity required to match Architect's sample. Protect with adhesive paper covering.
1. Satin: Directional polish finish (ASTM A480 NO. 4). Graining directions as shown or, if not shown, in longest dimension.

C. Aluminum: Extrusions per ASTM B221; sheet and plate per ASTM B209.

D. Paint: Clean exposed metal parts and assemblies of oil, grease, scale, and other foreign matter and factory paint one shop coat of standard rust-resistant primer. After erection, provide one finish coat of industrial enamel paint. Galvanized metal surfaces shall be neatly touched-up with Galvacon™ or equal.

E. Prime Finish: Clean all metal surfaces receiving a baked enamel paint finish of oil, grease, and scale. Apply one coat of rust-resistant primer followed by a filler coat over uneven surfaces. Sand smooth and apply final coat of primer.

F. Baked Enamel Finish: Prime finish per above. Unless specified "prime finish" only, apply and bake three (3) additional coats of enamel in the selected solid color.

2.3 PERFORMANCE

A. Public Escalator Duty Type:
1. Escalator system and all individual components or subsystems designed to operate under moderate loads and operation:
   a. 2.0 persons per step.
   b. Loading factor of 265 lbs. per step.
   c. Continuous operation:
      1) 24 hours per day
      2) 7 days per week
2. 150,000 hours of useful life preceding replacement or major component obsolescence.

B. Step Speed: Unit shall be capable of operating at contract speed under any loading condition in either direction of travel.

C. Handrail Speed: Synchronized with step movement.

D. Noise and Vibration Control: Provide sound isolation within truss as required to limit noise levels relating to escalator equipment and its operation to no more than 60 dBA, measured 3'-0" above escalator at any point of its length.

2.4 OPERATION

A. Each unit shall be capable of operating smoothly and quietly at rated speed with synchronized step and handrail operation in either direction of travel.

2.5 MACHINE AREA EQUIPMENT

A. Driving Machine: Provide a worm geared planetary or helical spur gear reduction unit coupled directly to AC induction or P.M.S.M. drive motor.
   1. Gearbox lubrication: Synthetic oil shall be used in order to prolong the intervals between oil changes.
   2. The main shaft which drives the steps shall be driven with chain transmission via heavy-duty duplex chain as a minimum.

B. Drive Motor: Three (3) phase, operating at no greater than 1200 rpm. Motors shall be designed to operate in confined unvented spaces. Motor insulation class “F” or greater. Incorporate SCR soft start with closed transition.
   1. Synthetic oil shall be used in order to prolong the intervals between oil changes. The main shaft which drives the steps shall be driven with chain transmission via a heavy-duty duplex chain as a minimum.

C. Reduced Speed and Passenger Approach Activity: Provide means to monitor usage, including count of users over entry. When use drops to below a preset level, reduce step speed via variable motor speed operation.

D. Brake: Electromechanical brake to safely decelerate, stop and hold rated load. Brake shall stop escalator operating in the down direction at a constant rate not greater than 3 feet/second^2. For safety and ease of maintenance, a means to move the steps via flywheel or a crank shall be provided.

E. Permanent Magnet Ceramic Brake: A load compensating brake system shall be installed. The brake shall be capable of automatically stopping the escalator quickly but gradually, and hold the escalator stationary under full load whenever the power is interrupted. The brake shall be “fail safe” and electrically released. The system shall continually adjust brake torque to maintain constant deceleration independent of the load. The brake shall not cause the escalator to come to an abrupt stop.

F. Controller: UL/CSA labeled.
   1. Compartment: Securely mount all assemblies, power supplies, chassis switches, relays, etc., in steel cabinet, removable from machine space for ease of access to controls and wiring. Include mainline circuit breaker, phase, and overload protection.
   2. Microprocessor-Related Hardware
      a. Provide built-in noise suppression devices which provide a high level of noise immunity on all solid-state hardware and devices.
      b. Provide power supplies with noise suppression devices.
      c. Isolate inputs from external devices (such as safety switches) with opto-isolation modules.
      d. Design control circuits with one leg of power supply grounded.
      e. Safety circuits shall not be affected by accidental grounding of any part of the system.
      f. System fault log memory shall be retained in the event of power failure or activation of any safety device.
      g. Equipment shall be provided with Electro Magnetic Interference (EMI) shielding.
      h. The escalator controller and external fault diagnostic display shall include a clear text display in the appropriate national language to allow immediate identification of the cause of a shutdown. The display shall be located at the controller in the upper well of the

escalator and in the upper and lower inner decking of the escalator. The display system with memory shall provide 2 lines of 20 characters minimum for displaying programmable messages and fault conditions. Operation of the fault diagnostic system shall be possible at the display point via menus and keypads adjacent to or contained as part of the display system

3. Wiring: CSA labeled copper for factory wiring. Neatly route all wiring interconnections and securely attach wiring connections to studs or terminals.
4. Permanently mark components (relays, fuses, PC boards, etc.) with symbols shown on wiring diagrams.

2.6 MAINTAINABILITY

A. The controller shall be designed to be fully maintained by licensed elevator mechanics. Decaying circuitry, limiting access codes and hand-held plug-in units of proprietary design will not be accepted.

2.7 CONTROLLER

A. Main switch, motor protection and control devices shall be installed in a NEMA rated cabinet that shall be situated in the upper machinery space of the escalator. The cabinet shall be supplied per ANSI/ASME standards by the escalator manufacturer. It shall be comprised of a steel enclosure with all required relays, automatic circuit breaker and terminals completely wired for the escalator control. Fault annunciation shall be provided to identify activation of specific escalator safety devices.
   1. The escalator controller and fault diagnostic system shall include a clear text display in the appropriate national language/numeric code to allow immediate identification of the cause of a shutdown. The display shall be located at the controller in the upper well of the escalator or in the upper inner decking of the escalator. The display system with memory shall provide 2 lines of 20 characters' minimum for displaying programmable messages and fault conditions. Operation of the fault diagnostic system shall be possible at the display point via menus and keypads adjacent to or contained as part of the display system.
   2. Each escalator shall be provided with a pendant style running button assembly to operate the escalator during maintenance. Plug-in connection devices for the pendant station shall be provided at both ends of the escalator within the well space beneath the floor plates. The pendants shall include constant-pressure push buttons to operate the escalator in either direction and must be equipped with a maintenance-operation stop button. A minimum of 10'-0" of cable shall be provided.

B. Auxiliary output contacts: Escalators in this specification are required to have auxiliary output contacts. The contacts will be used to monitor.

C. Stop Switch in Machinery Spaces: Each escalator shall be provided with stop switches in the upper and lower pits. When these switches are activated, the escalator will come to a controlled stop.

2.8 STEPS

A. Step Assembly: Single piece die-cast aluminum, fastened to the step band. Step rollers shall have sealed bearings and be tired with synthetic composition material. Treads and riser shall be cleated. Steps shall be covered on the underside with sound-deadening material. Provide renewable step demarcation on trailing edge of each step tread and on both sides of each step tread.

B. Step Drive Assembly: Direct or indirect drive. Machine sprockets at each side over which step chains or step chain rollers shall pass and transmit motion from machine to steps. If indirect chain drive is used between machine and drive sprocket, provide emergency brake on drive assembly to automatically set

if drive chain fails. Provide roller-type sealed bearings. The top sprocket assembly of the step driving unit shall be carried on two brackets rigidly attached to the truss to insure and maintain proper alignment of the unit and shall be removable intact from the truss.

C. Step Chains: Steel links with hardened pins connecting adjacent steps and engaging drive sprockets. Provide synthetic composition roller assemblies with sealed bearings rated for heavy-duty operation. Escalator design shall permit chain inspection and operation while unit is running with steps removed allow for one in five steps to remain in unit. Chains shall be protected from the elements.
   1. Provide endless, roller type step chains; one (1) on each side of step.
   2. Lubrication free.
   3. Step chains shall be of heat-treated steel construction, supported at intervals by linkage wheels.
   4. A means to prevent steps from coming into physical contact with each adjacent step and to prevent chains from sagging or buckling shall be provided.
   5. A means to maintain constant distance between step axles shall be provided.
   6. An automatic tensioning device to maintain tension under load and to compensate for wear shall be provided. The device shall be located within the truss at the lower end.
   7. Step chains shall be constructed to permit removal of segments for replacement purposes.
   8. Support wheels spaced to distribute load and to guide linkage throughout run. Rollers shall be constructed of polyurethane material, with diameter sufficient to provide reliability, maintainability, smoothness of motion, and to operate within noise level requirements. The chain rollers shall have polyurethane tires in hubs, and sealed bearings.
   9. Each pair of step chains shall be a matched set within manufacturing tolerances. Only precision, roller fishplate of high grade, heat treated steel shall be used as step chains. The pins, axles, bushing, and rollers shall be hardened and round.
   10. A shielding device shall be provided to protect chain, track guides, and rollers against water, dirt and debris.

D. Step Tracks: Construct from steel. Tracks shall be bolted sections including transitions to facilitate maintenance and replacement if required. Track sections, including transitions, shall be factory installed and aligned to insure smooth, quiet operation of running gear under all conditions. The individual track section, together with transition section, step chain tension carriage, main drive shaft and handrail drive shaft shall form a fully independent assembly. Welding the tracks is not acceptable.

E. Provide skirt brushes.

F. Step Chain Sprockets: The step chain sprockets shall be accurately machined to distribute the load evenly on the sprocket and chain rollers and be designed for smooth operation.

2.9 WELLWAY EQUIPMENT

A. Truss: Clean down completely, remove all oil and grease and reuse existing. Check for stress fractures and verify integrity. Inspect all existing welds, rivets and overall structure. The existing truss shall be cleaned and painted with Manufacturer's standard enamel paint prior to installation of the modernization components.
   1. Verify that in the event of track system failure, the truss shall retain the running gear in its guides.
   2. Verify truss shall safely retain steps and running gear, and in case of failure of track systems, truss will retain step mechanism within guides and envelope of the truss.
   3. Verify truss is capable of supporting the dead weight of the escalator and a passenger load which is required by Code.
   4. Truss shall not vibrate when the escalator is in use.

B. Truss: The existing truss shall be reused. The following demolition work shall be performed:
   1. Upper and Lower End:
      a. Removal of track and support brackets.
      b. Removal of access cover support plates.
      c. Removal of selected truss cross members.
      d. Removal of handrail support return brackets.
   2. Incline:
      a. Removal of top and return track
      b. Removal of handrail return brackets.
      c. Modification to truss cross members.

C. Isolation Mounting: Existing isolation mounting shall be replaced.

D. Drip Pans: Reuse and clean existing.

E. Pre-assembled escalator modules. The upper and lower escalator end shall be pre-assembled by the escalator contractor prior to shipment to the jobsite.
   1. The upper module will include plate-steel enclosure and truss interface components, drive machine, motor and brake, drive chain, main drive gear assembly with auxiliary brake, track subassemblies, handrail guidance and drive assembly, skirt and track support assemblies, combplate/floorplate assembly and all related safety circuitry and switches.
   2. The lower module shall include plate-steel enclosure and truss interface components, tension carriage assembly, track subassemblies, handrail guidance skirt and track support assemblies, combplate/floorplate assembly and all related safety circuitry and switches.

F. Tracks: New tracks shall be designed and fabricated to support and retain the steps and running gear at the rated load and at the highest speed specified. Tracks shall be assembled and secured together for easy removal and replacement of sections. The system shall be adjustable, with no welding of the track sections at the joints. Tracks shall be properly supported on stanchions to provide correct alignment and smooth transition to return stations. The rolling surface of the incline track shall be a minimum thickness of 3 mm. The transition track shall be a minimum thickness of 10mm. The guiding surface of the wheels shall be galvanized steel profiles with smooth and even running surfaces. Joints shall be cut diagonally to the running direction. A second, continuous step guiding profile shall be provided above the step chain rollers. Truss interface components and track sub-assemblies, with welded steel plate construction, shall be included.

G. Drip Pans: provide new galvanized welded, water and oil-tight, steel pans with sufficient strength to withstand weight of workmen, entire width and length of truss. If existing is to be retained completely clean and paint with three coats of Rustoleum™.
   1. If new, the pans shall also be sloped for proper drainage and collection of spent lubricants as well as any moisture or water which may enter the escalator. Drip pans of sufficient size to collect and maintain, within truss areas, oil and grease drippings from step linkage and all forms of loose debris that may be deposited in drip pans from steps at turn around points at upper and lower portions of truss shall be provided. Access to drip pans at lower landings of escalators for the purpose of cleaning drain catch basins shall be provided.

H. Lower Reversing Station Tension Carriage: Fully independent, floating track system with spring tensioning device to maintain constant step chain tension.

I. Maintenance Speed reduction: Provide reduced speed maintenance operation controlled by a manual handset. When operated, the escalator shall run in the direction selected, at not more than ten (10) feet per minute. This speed shall be maintained with the steps in place or removed. The running shall be

continuous with constant pressure on “up” or “down” button on the handset. The handset shall have a thirty (10) foot cord with a plug connector. When plugged into receptacle, there shall be no means of operating or running the escalator except by the service handset. Receptacles shall be located in both the top and bottom pits.

J. Electrical Wiring
1. Conductors: Copper throughout with individual wires coded and all connections identified on studs or terminal blocks. Type SO cable may be utilized for wiring conducting 30 volts or less, per NEC 620-21.
2. Conductors: 31 Volt RMS or greater. Provide conduit, junction boxes, connections and mounting means per requirements of Division 16. Provide painted or galvanized steel or aluminum conduit, conduit size minimum 3/8". Flexible conduit exceeding 18" in length shall not be used.

2.10 HANDRAILS

A. Construction: Laminated steel, wire mesh or steel cable and rubber running on brass, bronze or stainless steel guides. No cotton fabric shall be used. Handrail shall be manufacturer’s standard oval cross section with a flat top and heavy-duty metal support section. Handrail shall be spliced and vulcanized with smooth joint. Handrail shall be driven at the same speed as the steps. Provide tensioning device and slack-tension switch. Provide a minimum 180 degree arc contact of the handrail around the drive wheel.

B. Handrail Entry Guards: Provide directional guards to prevent hands or foreign objects from being carried into the handrail entrance of the newel.

C. Tensioning Device: New.

D. Handrail Drive: New.

E. Friction Drive Wheels: New. Rubber faced wheel, or V-grooved wheel.

2.11 SIDE CONSTRUCTION
1. Balustrade: Reinforced 14-gauge stainless steel satin finish.

B. Skirt Panels: New 12 gauge stainless steel with anti -friction coating. Install and adjust to maintain clearance of step treads to skirt of not more than 3/16". Duplicate. Smooth all joints and provide a friction reducing material to prevent binding. Attach panels to permit easy removal for inspection, lubrication, and adjustment of safety devices. Add stiffeners to meet step/skirt index requirements.
1. Black Teflon coated 11 gauge cold rolled steel.
2. Teflon coated 11 gauge stainless steel #4 satin finish.

C. Deck Boards: New 14 gauge stainless steel. All deck section joints shall abut to provide a smooth surface. Decking shall resist a live load of 175 pounds per square foot without permanent deformation. Provide continuous deck board between adjacent pairs of escalators.

D. Newel Ends: Continuous metal guides at upper and lower end of the balustrade, matching profile of handrail guides. Newel end shall include a multi-roller bearing or rotating wheel system to minimize friction and provide smooth return of handrail.

E. Trim and Moldings: New to match deck joints. Smooth all joints and place in first-class condition.

2.12 LANDINGS

A. Flat Steps: Provide upper and lower landing with two (2) flat steps.
   1. DE 16 Only: Provide upper and lower landing with three (3) flat steps.

B. Combplates: Aluminum or reinforced plastic composite or alloy with non-slip surface. Provide removable comb sections. Apply yellow powder coat finish. Teeth shall be designed to withstand a load of 250 pounds in the upward direction on any one tooth.
   1. The area where the steps enter the comb-plates shall be illuminated by combplate lights, installed in the skirt panel at both sides of the escalator.

C. Equipment Access Plates at landings: Aluminum or other alloy with non-slip surface. Provide removable access plates to provide for entry into equipment spaces at upper and lower ends. Plates shall cover entire truss opening. Access plates shall match material and finish of adjacent landing plates. Provide without manufacturer's name or logo. All removable plates shall have rollers or shall be hinged.

D. Access Cover Extensions: The escalators shall be designed with access cover extensions of adequate length to match existing opening dimensions eliminating need for infill of existing floor material.

2.13 SAFETY REQUIREMENTS

A. Meet or exceed the current ASME A17.1 code being enforced in the area.

B. Safety Devices: Safety devices depending upon interruption of electric circuit for their operation shall be interlocked with electric power supply to motor to apply brakes, and bring escalator to a smooth, safe stop in either direction of travel.

C. An interlock shall be provided to prevent operation of escalator until safety hazard or malfunction has been corrected if escalator stops because of malfunction, or actuation of one or more of the safety devices. Escalator can be restarted by use of keyed switch only.

D. Safety devices shall be mounted in locations accessible for maintenance within escalators, and these devices shall be designed for ease of adjustment or reset. Devices shall be located so that operation is not affected by direct moisture and debris.

E. If escalators are equipped with braking system dependent upon activation of springs, then springs shall be guidance compression type. The use of weights or self-excitation of the brake release shall not be allowed.

F. Disconnect switches capable of being looked in the "off" position shall be provided to both escalator pits, and at the drive of each escalator to prevent the starting of escalator from any other location.

G. Speed Monitor/Anti-Reversal: The escalator shall be equipped with a speed monitor with anti- reversal device. An electronic detector shall be provided that constantly monitors escalator speed. If the escalator speed drops to 50 percent of nominal speed or exceeds nominal speed by 20 percent, a stop shall be initiated.

H. Broken Step Chain Device: A broken step chain device or devices shall be provided with electric contacts that shall cause the brake to be applied should either or both of the step chains break or should the tension on the chains drop below or exceed a predetermined value.

I. Broken Drive Chain Device: A broken main drive chain safety device shall be provided with electric contacts that shall cause the secondary brake to be applied should the main drive chain slacken or break. (Not required with direct drive units).

J. Stop Switches in Machinery Space: service personnel during their maintenance routine shall provide a stop switch in both the upper and lower machinery spaces for use.

K. Skirt Obstruction Switches: The skirt panels at both the upper and lower section of the escalator shall be equipped with electrical switches. The deflection of the skirt panel caused by lateral pressure shall activate the electrical switch and cause the escalator to stop. The skirt switches shall be located to insure the escalator stop before a trapped object reaches the comb.

L. Step Up-thrust Device: A step up-thrust device shall be provided in the lower transition radius that shall detect upward step displacement should it occur as the steps travel through the lower transition radius. If activated, the escalator shall be brought to a smooth stop.

M. Handrail Speed Monitor/Stopped Handrail Device: A handrail speed monitor/stopped handrail device shall be provided to assure synchronous speed with step speed. If the deviation is greater than 20 percent or less than 50 percent, the emergency alarm shall sound. The alarm shall be controlled by an adjustable timer and shall continue to sound for a maximum of 15 seconds after which the escalator shall come to a smooth stop.

N. Handrail Entry Safety Device: The newel base where the handrail enters the escalator shall be equipped with a spring loaded flap enclosure that shall free objects that are in danger of becoming wedged between the handrail and the entry point. The device shall be equipped with a safety switch that when activated shall cause the escalator to come to a smooth stop.

O. Step Level Device: Step level devices shall be located at the top and bottom of the escalator. These devices shall detect downward displacement of 1/8 inch or greater at the riser end of the step. When detected the device shall cause the escalator to stop prior to the detected step entering the comb. The device shall be of the manual reset type.

P. Comb plate Impact Device: A comb plate impact device shall be provided that shall sense wedging action occurring at and pressing severely against the comb plate. When activated the escalator shall be brought to a smooth stop.

Q. Starting Switch Monitor: The escalator's electrical starting circuits shall be designed to prevent both the starting circuit and safety circuit from being energized at the same time.

R. Missing Step Device: A missing step device shall be provided to detect a missing step and bring the escalator to a stop prior to the gap resulting from the missing step emerging from the comb.

S. Phase Protection: An electrical contact shall sense any phase failure or phase reversal and bring the escalator to a smooth stop. This device shall also prevent the escalator from being started under the prevailing conditions.

T. Counter Tracks (Catching Arms): Shall be located at the lower end of the escalator to retain the step chain in case of breakage.

U. Step Turnaround Guards, Sheet Metal Aprons: Shall be provided at each end to prevent the accidental contact by service technicians with rotating equipment.

V. Passenger Approach variable speed: I passenger approach frequency drops below a preset level provide variable speed operation.

2.14 SIGNAL AND CONTROL FIXTURES

A. Control Station: At both the upper and lower landings, located near the handrail inlet, a station shall be provided which shall include a key actuated direction-starting switch. The escalator will not restart automatically. It must be restarted with the key after shut down.

B. Emergency Stop Buttons: Emergency stop buttons shall be provided designed so momentary pressure of either button shall cut off the electrical power supply to the motor and bring the escalator to rest. One emergency stop button shall be located at each landing. The stop button shall be red in color. The button shall be housed under a clear, high impact resistant plastic cover, which shall be self-closing. Instructions for operating the stop button shall be imprinted on the cover in half-inch high letters. When the cover is lifted, an audible alarm shall sound until the cover is returned to its closed position.

C. Diagnostic Access Port: Provide upper and lower landings with RJ-11 diagnostic access port.

D. Fault Indicator: Provide external fault indicator display at upper and lower end of truss to display source/fault code without removal of equipment access plate. Locate indicator in handrail inlet box or deck board visible from landing plate.

2.15 SIGNS

A. Caution Signs: Provide caution signs at top and bottom landings per Code engraved plate with material and finish to match decking. Provide rear-mounted, flush, caution signs in skirt panel at top and bottom landings per ASME A17.1 by SCS or Owner-approved equivalent. Provide engraved stainless steel plate of code-required size with material and finish to match decking. Engraving fill shall be in code colors. Sign shall include pictorial and the following wording:
1. Caution
2. Passengers only
3. Hold Handrail
4. Attend Children
5. Avoid Sides
6. No Carts

PART 3 - PART 3 – EXECUTION

3.1 SITE CONDITION INSPECTION

A. Prior to beginning installation of equipment, examine hoistway and machine room areas. Verify that no irregularities exist which affect execution of work specified.

B. Do not proceed with installation until work in place conforms to project requirements.

3.2 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver material in Provider’s original, unopened protective packaging.

B. Store material in original protective packaging. Prevent soiling, physical damage, or moisture damage.

C. Protect equipment and exposed finishes from damage and stains during transportation, erection, and construction.

3.3 INSTALLATION

A. Install all equipment in accordance with Provider's instructions, referenced Codes, specification and approved submittals.

B. Install machine room equipment with clearances in accordance with referenced Codes and specification.

C. Install all equipment so it may be easily removed for maintenance and repair.

D. Install all equipment for ease of maintenance.

E. Install all equipment to afford maximum accessibility, safety, and continuity of operation.

F. Remove oil, grease, scale, and other foreign matter from the following equipment and apply one coat of field-applied machinery enamel.
1. All exposed equipment and metal work installed as part of this work which does not have architectural finish.
2. Machine room equipment, hoistway equipment including guide rails, guide rail brackets, and pit equipment.
3. Neatly touch up damaged factory-painted surfaces with original paint color. Protect machine-finish surfaces against corrosion.

3.4 FIELD QUALITY CONTROL

A. Work at jobsite will be checked during course of installation. Full cooperation with reviewing personnel is mandatory. Accomplish corrective work required prior to performing further installation.

B. Have Code Authority acceptance inspection performed and complete corrective work.

3.5 ADJUSTMENTS

A. Track Alignment: Re-align factory installed tracks if required to ensure continuous 4-point contact with step and chain rollers. Secure joints without gaps and file any irregularities to a smooth surface.

B. Lubricate all equipment in accordance with Provider's instructions.

C. Adjust motors, brakes, controllers, stopping switches, and safety devices to achieve required performance levels.

D. Adjust brakes and controlled descent devices to stop escalator with variable load. Drive machine brakes shall stop the down running escalator at a rate no greater than three feet/second^2.

E. Adjust handrail speed to coincide with step speed.

3.6 CLEANUP

A. Keep work areas orderly and free from debris during progress of project. Remove packaging materials on a daily basis.

B. Remove all loose materials and filings resulting from work.

C. Clean machine room equipment, truss interior, and pit.

D. Clean balustrades, deck boards, skirt panels, operating and signal fixtures, and trim.

3.7 ACCEPTANCE REVIEW AND TESTS

A. Review procedure shall apply for individual escalators, portions of groups of escalators and completed groups of escalators accepted on an interim basis or escalators and groups of escalators completed, accepted, and placed into operation.

B. Provider shall perform review and evaluation of all aspects of its work prior to requesting Consultant's final review. Work shall be considered ready for Consultant's final contract compliance review when copies of Provider's test and review sheets are available for Consultant's review and all elements of work or a designated portion thereof are in place and escalator or groups of escalators are deemed ready for service as intended.

C. Furnish labor, materials, and equipment necessary for Consultant’s review. Notify Consultant a minimum of five (5) working days in advance when ready for final review of escalator or group.

D. Equipment and Instruments: Furnish equipment and instruments to perform required tests. The following instruments may be necessary to compete the tests;
1. Multi meter
2. 500 Volt Megger
3. Alternating-current voltmeter and ammeter
4. Celsius-calibrated thermometers (two minimum)
5. Precision tachometer
6. Decibel meter for noise test
7. Test weights for brake test
8. Accelerometer for ride quality verification
9. Skirt index measurement device

E. Consultant’s written list of observed deficiencies of materials, equipment and operating systems will be submitted to Provider for corrective action. Consultant’s review shall include as a minimum:
1. Workmanship and equipment compliance with Contract Documents.
2. Contract speed and performance comply with Contract Documents.
3. Performance of following is satisfactory:
    a. Starting and running
    b. Stopping
    c. Controlled stop
    d. Equipment noise levels
    e. Signal and operating devices
    f. Overall ride quality
    g. Handrail and step speed
    h. Operations of safety devices
4. Operating Tests:
    a. Overspeed Protection Device: Test by operating at rated speed, tripping overspeed device manually.
    b. Handrail-Tension Device: Test manually.
    c. Broken Drive Chain Devices: Test by operating at rated speed, tripping broken chain device manually.

5. Test Results
   a. In all test conditions, obtain specified contract speed, handrail speed, controlled descent, performance, stopping, ride quality and operation noise levels to satisfaction of Purchaser and Consultant.

F. Performance Guarantee: Should Consultant's review identify defects, poor workmanship, variance or noncompliance with requirements of specified Codes and/or ordinances, or variance or noncompliance with the requirements of Contract Documents, Provider shall complete corrective work in an expedient manner to satisfaction of Purchaser and Consultant at no cost as follows;
   1. Replace equipment that does not meet Code or Contract Document requirements.
   2. Perform work and furnish labor, materials, and equipment necessary to meet specified operation and performance.
   3. Perform retesting required by Governing Code Authority, Purchaser and Consultant.

G. A follow-up final contract compliance review shall be performed by Consultant after notification by Provider that all deficiencies have been corrected. Provide Consultant with copies of the initial deficiency report marked to indicate items which Provider considers complete. If additional reviews are required due to Provider's gross non-compliance with initial and follow-up deficiency reports, consultant shall bill Provider at normal billing rates plus expenses, and Provider acknowledges it will pay for additional compliance reviews.

3.8 PURCHASER'S INFORMATION

A. Provide three sets of neatly bound written information necessary for proper maintenance and adjustment of equipment within 30 days following final acceptance. Final retention will be withheld until data is received by Purchaser and reviewed by Consultant. Include the following as minimums:
   1. Straight-line wiring diagrams of "as-installed" escalator circuits, with index of location and function of components. Provide one set reproducible master. Mount one set wiring diagrams on panels, racked, or similarly protected, in escalator machine room space. Provide remaining set rolled and in a protective drawing tube. Maintain all drawing sets with addition of all subsequent changes. These diagrams are Purchaser's property.
   2. Lubrication instructions, including recommended grade of lubricants.
   3. Parts catalogs for all replaceable parts including ordering forms and instructions.
   4. Four sets of keys for all switches and control features properly tagged and marked.
   5. Diagnostic equipment complete with access codes, adjusters manuals and set-up manuals for adjustment, diagnosis and troubleshooting of escalator system, and performance of routine safety tests.

END OF SECTION

SECTION 143200
MOVING WALKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Six (6) Moving Walks as follows:
   1. Moving Walk Width:
      a. Moving Walks DMSW 1, 2, 3, 4, 6, 7: 48" wide (40" pallet).
   2. Moving Walk Balustrade:
      a. Moving Walks DMSW 1, 2, 3, 4, 6, 7: Metal.

1.2 SOURCE QUALITY CONTROL

A. Source Limitations:
   1. Obtain vertical and horizontal equipment, including escalators, specified in another Division 14 Section from single manufacturer.

B. Buy American Requirements:
   1. The Contractor shall comply with the applicable FAA Buy American Preference requirements set forth in Title 49 of the United States Code 50101, BABA and other related Made in America Laws, US statutes, guidance, and FAA Policies which provide that federal funds may not be obligated unless all iron, steel, and manufactured goods used in AIP funded projects are produced in the United States, unless the Federal Aviation Administration has issued a waiver for the product; the product is listed as an Excepted Article, Material Or Supply in Federal Acquisition Regulation subpart 25.108; or is included in the FAA Nationwide Buy American Waivers Issued list. If the contractor procures any capital items with Federal funds it is the Contractors responsibility to obtain the Buy America certification under such regulations.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Include capacities, sizes, performances, operation, control, signal systems operations, safety features, finishes, and similar information.
   2. Include product data for lighting systems, demarcation, and combplates.

B. Shop Drawings:
   1. All shop drawings submitted must be signed and sealed by a Engineer licensed in the state where the vertical transportation system is being installed.
   2. Provide scaled shop drawings and construction drawings of the following:
      a. Plan and section layouts of well-ways, pits, intermediate support, truss structural support locations and overall rise, to include the following:
         1) Location of all equipment.
         2) Static and dynamic loads imposed on building structure.
         3) Details of equipment isolation.
         4) Required clearances around equipment.
         5) Machine room heat release.
         6) Power requirements:
            a) motor horsepower, code letter, starting current, full load running current, and demand factor.

b) Provide maximum and average power consumption.
7) Service connections.
b. Well/Pit Equipment:
1) Pit reactions/loads.
2) Stop switches.
3) Sump or drain location.
c. Fixtures:
1) Operational display.
2) Run/Stop switch.
3) Signage.
4) Lighting.
3. All submittals shall be clearly marked and identified with project title and appropriate device identification.
4. All submittals are subject to approval.
5. Corrections requested shall be incorporated onto the submittals.
6. All submittals shall also be submitted to Elevator Consultant via Portable Document Format (.pdf).

C. Samples for Initial Selection:
1. For finishes involving surface treatment, paint or color selection per Architectural list.

D. Samples for Verification:
1. For exposed escalator and signal equipment finishes.
2. Samples of sheet materials: 3" (75 mm) square.
3. Running trim members: 4" (100 mm) lengths.

1.4 CLOSEOUT SUBMITTALS

A. Record Documents
1. The following record documents shall be furnished upon completion and before final payment:
a. Shop Drawings:
1) Complete sets of as installed plan and section layouts of escalators, well/pits, machinery spaces, and to include requirements contained within submittal drawings.
b. Wiring Diagrams:
1) Complete sets of as installed straight-line wiring diagrams, showing the electrical connections of all altered vertical transportation equipment, shall be furnished upon completion.
2) A legend sheet shall be furnished with each set of drawings containing the following information:
a) Name and symbol of each relay, switch and other electrical or solid-state apparatus.
b) Location on drawings, drawing sheets, number and area of switches and relays, etc., and location of all contacts.
c) Location of apparatus whether on controller, in well, or operating devices.
c. Maintenance and Operating Manuals:
1) Description and sequence of operation of all equipment installed, including operating use for Building Personnel as well as system troubleshooting manuals, with all Fault Codes, for technicians.
2) Maintenance instructions and procedures of all vertical transportation equipment installed, including parts lists, for each elevator system.

3) Lubrication charts indicating all lubricating points and type of lubricant recommended for all equipment.
4) Complete parts catalogs for all replaceable parts.

B. Tools:
1. The following equipment shall be furnished upon completion and before final payment:
a. The Elevator Contractor shall provide all the necessary tools, including laptop, hand-held devices, required software and manuals, required to troubleshoot, adjust, synchronize, calibrate, repair and maintain the vertical transportation systems, as well as perform all necessary procedures to perform all safety tests as required by code and local governing authority.
b. Owner's equipment and software shall be updated regularly as necessary to properly troubleshoot, adjust, synchronize, calibrate, repair, maintain and test the vertical transportation systems. All equipment and/or software shall be of the same version as issued to technicians maintaining the vertical transportation systems.
c. The Elevator Contractor shall provide a backup copy of any software that resides on the troubleshooting tool.
d. Upon cancellation of service agreement, the Elevator Contractor shall provide all upgrades indicated above.

C. Keys:
1. Four sets of keys to operate all keyed switches and locks shall be furnished upon completion.
2. Keys shall be properly tagged.
3. All keying shall be arranged with the Contractor.

1.5 PERMITS, TESTS & CERTIFICATES

A. Permits:
1. The Elevator Contractor shall secure the necessary permits required for work to be performed, including work performed by sub-contractors.
2. The Elevator Contractor shall also secure the necessary permits required for the work to be performed to remove any existing devices on the premises.
3. The Elevator Contractor shall obtain and pay for all municipal and state permits necessary for execution of the elevator work, including fees for renewing permits.
4. The Elevator Contractor shall be responsible for posting all permits as required by the AHJ.
5. The Elevator Contractor shall be responsible for obtaining final sign-off for each permit filed by them.

B. Tests and Inspections:
1. Perform an operational test for 24 continuous hours without recording any faults on each escalator prior to performance of Tests in 1.5 B. 2 & 3.
2. The Elevator Contractor shall perform all necessary tests as required by ASME A17.1 and recommended by A17.2.
3. The Elevator Contractor shall be responsible for scheduling the necessary tests as required by the local authorities.
a. Any fees associated with a missed appointment, expediting of test or overtime test due to delays caused by the Elevator Contractor shall be the responsibility of the Elevator Contractor.

C. Certificates:
1. Elevator Contractor is responsible for obtaining and providing Contractor with all temporary and final inspection certificates of the proper governing authorities and shall provide the Contractor with such certificates.
2. The Elevator Contractor shall pay for all fees necessary for obtaining temporary and final inspection certificates.

D. Violations:
1. Any violations that exist on devices being removed shall be cleared by the Elevator Contractor prior to final acceptance by the Contractor.

1.6 QUALITY ASSURANCE

A. Compliance with Regulatory Agencies:
1. Comply with most stringent applicable provisions of codes, laws, and/or authorities, including revisions and changes in effect:

B. Inspections:
1. The Elevator Contractor is subject to reviews by the Consultant and/or Contractor at any time throughout the project.

1.7 DELIVERY, STORAGE & HOISTING

A. General:
1. The protection of all equipment and exposed finishes shall be the responsibility of the Elevator Contractor during delivery, handling and installation until completion of project.
2. The Elevator Contractor shall replace damaged materials with new, at no additional cost for material and labor to Contractor.

B. Delivery & Storage:
1. It is expected that manufacturers' original packing shall adequately protect materials during delivery.
2. Deliver materials to the site ready for use in the accepted manufacturer's original and unopened containers and packaging, bearing labels as to type of material, brand name and manufacturer's name. Delivered materials shall be identical to accepted samples.
3. Store materials under cover in a dry and clean location, off the ground. Remove delivered materials that are damaged or otherwise not suitable for installation from the job site and replace with acceptable materials.
4. It is the responsibility of the Elevator Contractor to properly store and protect all materials in space provided or designated by the Contractor against damage, stains, scratches, corrosion, weather, construction debris and environmental conditions.

C. Hoisting:
1. All required hoisting and movement of equipment shall be the responsibility of the Elevator Contractor.

1.8 COORDINATION

A. General:
1. Coordinating the following requirements with the other trades:

B. Cast-in-Place Concrete:

1. Elevator Contractor to provide support locations requirements for connection for the General Contractor to provide or install.
2. Provide pit requirements, including location of sump pits or drains.

C. Electric:
1. Electrical service, outlets, lights, switches in elevator machine rooms and pits.

D. Sprinklers:
1. Including installation of sprinkler systems as per NFPA 13.

E. HVAC:
1. Provide necessary information to General Contractor and coordinate installation of equipment for escalator machine rooms.

F. Finishes:
1. Balustrades, skirt panels, fixtures.

1.9 WARRANTY

A. Manufacturer's Warranty:
1. Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

B. Warranty Period: one (1) year from date of Substantial Completion.
1. The Elevator Contractor shall guarantee that the materials and workmanship of the apparatus installed by them and any subcontractor under this contract, shall be first class in every respect and that he will make good on any defects not due to ordinary wear and tear or improper use, which may develop within one year from the date of final acceptance of all equipment.
2. Manufacturer's warranty to repair or replace defective products or their components in the event of defects within a specified period.
3. Neither the final payment nor any provisions of the contract documents shall relieve the Elevator Contractor of the extent and period provided by law and upon written notice he shall remedy any defects due thereto and pay all expenses for any damage to other work resulting there from.
4. The warranty as outlined above, for all devices, shall start from the date of final acceptance of each device, by the Consultant and the Owner, of all work specified and intended under these contract documents.
5. Provide attic stock and other materials as required, delivering and storing usable-but-otherwise-uninstalled materials, attic stock, required spares, and other items as instructed by the Architect. Finishes Binders, tubs, and storage boxes for stored materials shall be labeled, using the specifications numbering system indicated for that material in the Construction Documents. Consistent with that labeling, Contractor shall create and provide to the Owner an MS Excel spreadsheet inventory of attic stock and other materials, indicating product name, applicable specification section, quantity of contents, and locations of its use.
    a. Six (6) complete new pallets per moving walk.
    b. Three (3) complete sets of comb segments per moving walk.
6.

1.10 MAINTENANCE

A. General:

1. All maintenance shall be performed according to the guidelines stated in manufacturer's Maintenance and Operations manuals.
2. Maintenance records for each device, including lubrication logs, check charts, shall be provided in each machine room.

B. Warranty Maintenance:
1. Upon final acceptance of each device, after Construction Maintenance period (if applicable), subsequent to receiving acceptance (sign-off) from the governing authorities and final acceptance, each device shall be accepted for full operation.
2. The warranty maintenance period shall begin for each device when all conditions in the above paragraph are met and will continue for the specified period.
   a. Warranty Maintenance Period may begin at the same time for each escalator.
3. The warranty maintenance program shall include the following:
   a. Monthly examinations, including adjustments, cleaning and lubrication of equipment.
   b. 24-hour Emergency Call back service shall be provided at no additional cost to Owner.
   c. Replacement of components as required, using only components produced by the original manufacturer.
      1) Each machine room or appointed area shall be equipped with a lockable storage cabinet to contain the necessary spare parts.

PART 2 - PRODUCTS

2.1 REFERENCES

A. Definitions:
1. Terms used are defined in the latest edition of the Safety Code for Elevators and Moving walks, ASME A17.1.
2. Reference to a device or a part of the equipment applies to the number of devices or parts required to complete the installation.
3. Provisions of this specification are applicable to all moving walks unless identified otherwise.

B. American National Standard Institute (ANSI):
1. A117.1 - Accessible and Usable Buildings and Facilities.

C. American Society of Mechanical Engineers:
1. ASME A17.1 - Safety Code for Elevators and Moving walks.
2. ASME A17.2 – Guide for Inspection of Elevators and Moving Walks.
3. ASME A17.5 – Elevator and Moving walk Electrical Equipment.

D. National Fire Protection Association (NFPA):
1. NFPA 13 – Installation of Sprinkler Systems.
2. NFPA 70 – National Electric Code.
3. NFPA 101 – Life Safety Code.

2.2 PERFORMANCE REQUIREMENTS

A. Pallet Speed:
1. Unit shall be capable of operating at contract speed under any loading condition in either direction of travel.

B. Handrail Speed:

1. Substantially same as pallet speed.

C. Noise and Vibration Control:
1. Provide sound isolation within truss as required to limit noise levels relating to moving walk equipment and its operation to no more than 60 dBA, measured 3'-0" above moving walk at any point of its length.

2.3 MOVING WALKS

A. Moving Walk System, General:
1. Manufacturer's public transportation moving walk systems.
2. Unless otherwise indicated, manufacturer's public transportation components shall be used, as included in public transportation moving walk systems and as required for complete system.

B. Description:
1. Moving Walk Identification: DMSW 1
2. Size:
   a. Moving Walk:48" Wide (40" Pallet).
3. Speed: 100 fpm.
4. Rise:
   a. Moving Walk: 120'-0" ±.
5. Configuration: Linear.
6. Arrangement: Separate.
7. Operation: Reversible.
8. Drive Motor Gear Box: Worm, Planetary, or Helical.
9. Balustrades: Vertical to deck.
10. Balustrade Finish: Satin finish stainless steel.
11. Deck Configuration: High inner and outer.
12. Deck Finish: Satin finish stainless steel.
13. Molding and Trim: Match deck finish.
14. Skirt Panels: Black low friction material applied to metal panels.
15. Handrail Color: Black.
16. Pallet Tread and Riser: Painted black, Cleated and meshed with adjacent pallet.
17. Power Supply: 480 Volts, 3 Phase, 60 Hertz.
18. Additional Features:
   a. Pallet demarcation lighting.
   b. Emergency stop buttons.
   c. Caution signs at each landing.
   d. Truss extension to suit structural support locations, moving walk.
   e. Truss isolation, moving walk.

C. Description:
1. Moving Walk Identification: DMSW 2
2. Size:
   a. Moving Walk:48" Wide (40" Pallet).
3. Speed: 100 fpm.
4. Rise:
   a. Moving Walk: 189'-0" ±.
5. Configuration: Linear.
6. Arrangement: Separate.
7. Operation: Reversible.

8. Drive Motor Gear Box: Worm, Planetary, or Helical.
9. Balustrades: Vertical to deck.
10. Balustrade Finish: Satin finish stainless steel.
11. Deck Configuration: High inner and outer.
12. Deck Finish: Satin finish stainless steel.
13. Molding and Trim: Match deck finish.
14. Skirt Panels: Black low friction material applied to metal panels.
15. Handrail Color: Black.
16. Pallet Tread and Riser: Painted Black, Cleated and meshed with adjacent pallet.
17. Power Supply: 480 Volts, 3 Phase, 60 Hertz.
18. Additional Features:
    a. Pallet demarcation lighting.
    b. Emergency stop buttons.
    c. Caution signs at each landing.
    d. Truss extension to suit structural support locations, moving walk.
    e. Truss isolation, moving walk.

D. Description:
1. Moving Walk Identification: DMSW 3
2. Size:
    a. Moving Walk:48" Wide (40" Pallet).
3. Speed: 100 fpm.
4. Rise:
    a. Moving Walk: 210'-0" ±.
5. Configuration: Linear.
6. Arrangement: Separate.
7. Operation: Reversible.
8. Drive Motor Gear Box: Worm, Planetary, or Helical.
9. Balustrades: Vertical to deck.
10. Balustrade Finish: Satin finish stainless steel.
11. Deck Configuration: High inner and outer.
12. Deck Finish: Satin finish stainless steel.
13. Molding and Trim: Match deck finish.
14. Skirt Panels: Black low friction material applied to metal panels.
15. Handrail Color: Black.
16. Pallet Tread and Riser: Painted Black, Cleated and meshed with adjacent pallet.
17. Power Supply: 480 Volts, 3 Phase, 60 Hertz.
18. Additional Features:
    a. Pallet demarcation lighting.
    b. Emergency stop buttons.
    c. Caution signs at each landing.
    d. Truss extension to suit structural support locations, moving walk.
    e. Truss isolation, moving walk.

E. Description:
1. Moving Walks Identification: DMSW 4, 7
2. Size:
    a. Moving Walks:48" Wide (40" Pallet).
3. Speed: 100 fpm.
4. Rise:
    a. Moving Walk: 170'-0" ±.

5. Configuration: Linear.
6. Arrangement: Separate.
7. Operation: Reversible.
8. Drive Motor Gear Box: Worm, Planetary, or Helical.
9. Balustrades: Vertical to deck.
10. Balustrade Finish: Satin finish stainless steel.
11. Deck Configuration: High inner and outer.
12. Deck Finish: Satin finish stainless steel.
13. Molding and Trim: Match deck finish.
14. Skirt Panels: Black low friction material applied to metal panels.
15. Handrail Color: Black.
16. Pallet Tread and Riser: Painted Black, Cleated and meshed with adjacent pallet.
17. Power Supply: 480 Volts, 3 Phase, 60 Hertz.
18. Additional Features:
    a. Pallet demarcation lighting.
    b. Emergency stop buttons.
    c. Caution signs at each landing.
    d. Truss extension to suit structural support locations, moving walk.
    e. Truss isolation, moving walk.

F. Description:
1. Moving Walk Identification: DMSW 6
2. Size:
    a. Moving Walk:48" Wide (40" Pallet).
3. Speed: 100 fpm.
4. Rise:
    a. Moving Walk: 148'-0" ±.
5. Configuration: Linear.
6. Arrangement: Separate.
7. Operation: Reversible.
8. Drive Motor Gear Box: Worm, Planetary, or Helical.
9. Balustrades: Vertical to deck.
10. Balustrade Finish: Satin finish stainless steel.
11. Deck Configuration: High inner and outer.
12. Deck Finish: Satin finish stainless steel.
13. Molding and Trim: Match deck finish.
14. Skirt Panels: Black low friction material applied to metal panels.
15. Handrail Color: Black.
16. Pallet Tread and Riser: Painted Black, Cleated and meshed with adjacent pallet.
17. Power Supply: 480 Volts, 3 Phase, 60 Hertz.
18. Additional Features:
    a. Pallet demarcation lighting.
    b. Emergency stop buttons.
    c. Caution signs at each landing.
    d. Truss extension to suit structural support locations, moving walk.
    e. Truss isolation, moving walk.

2.4 MATERIALS

A. General:
1. All materials and finishes are subject to approval by Architect.

B. Steel:
   1. Sheet Steel (Furniture Steel for Exposed Work):
      a. Stretcher-leveled, cold-rolled, commercial quality carbon steel, complying with ASTM A366, matte finish.
   2. Sheet Steel (for Unexposed Work):
      a. Hot-rolled, commercial quality carbon steel, pickled and oiled, complying with ASTM A568/A568M-03.
   3. Structural Steel Shapes and Plates:
      a. ASTM A36.

C. Stainless Steel:
   1. Type 304 series complying with ASTM A240, with standard tempers and hardness required for fabrication, strength, and durability.
   2. Apply mechanical finish on fabricated work in the locations shown or specified, Federal Standard and NAAMM nomenclature, with texture and reflectivity required to match Architect's sample.
   3. Protect with adhesive paper covering.
      a. No. 4 Satin:
         1) Directional polish finish.
         2) Graining directions as shown or, if not shown, in longest dimension.
      b. No. 8 Mirror:
         1) Reflective polish finish with no visible graining.
      c. Textured:
         1) .050 inches mean pattern depth with bright directional polish (No. 4 satin finish).

D. Aluminum:
   1. Extrusions per ASTM B221; sheet and plate per ASTM B209.
   2. Die Cast Aluminum – ASTM B108, Alloy 356.0, T6.
   3. Extruded Aluminum – FS QQ-A 200/8, Alloy 6061, T6.

E. Paint Finishes:
   1. General:
      a. Clean exposed metal parts and assemblies of oil, grease, scale, and other foreign matter and factory paint one shop coat of standard rust-resistant primer.
      b. Galvanized metal need not be painted.
   2. Prime Finish:
      a. Apply one coat of rust-resistant primer followed by a filler coat over uneven surfaces.
      b. Sand smooth and apply final coat of primer.
   3. All equipment and metal work installed under this contract, which does not have a baked enamel or special architectural finish, and which is exposed in the hoistway, shall be cleaned and painted one field coat of enamel.
   4. All machine room equipment shall be painted upon completion of the installation with the manufacturer's standard machinery enamel.
   5. Elevator designation (number and/or letter) shall be prominently indicated on all machine room and machinery space equipment, top of car crosshead and pit equipment.

F. Baked Enamel Finish:
   1. Prime finish per above.
   2. Unless specified "prime finish" only, apply and bake three additional coats of enamel in the selected solid color.

2.5 OPERATION

A. Each unit shall be capable of operating smoothly and quietly at rated speed with synchronized pallet and handrail operation and speed in either direction of travel.

2.6 MACHINE ROOM EQUIPMENT

A. Driving Machine:
   1. Worm geared, planetary, or helical spur gear reduction unit coupled directly to AC induction or P.M.S.M. drive motor.
   2. Handrail drive shall be directly coupled to drive machine.

B. Drive Motor:
   1. Three-phase, operating at no greater than 1800 rpm.
   2. Motors shall be designed to operate in confined unvented spaces.
   3. Motor insulation class “F” or greater.
   4. Motor starting shall incorporate reduced current starting.

C. Brake:
   1. Electromechanical brake to safely decelerate, stop, and hold rated load.
   2. Brake shall stop moving walk operating in the down direction at a relatively constant rate not greater than 3.0 feet/second^2.

D. Controller:
   1. UL/CSA labeled.
   2. Compartment:
      a. Securely mount all assemblies, power supplies, chassis switches, relays, etc., on a substantial, self-supporting steel frame.
      b. Completely enclose equipment with covers.
      c. Provide means to prevent overheating.
   3. Relay Design:
      a. Magnet operated with contacts of design and material to insure maximum conductivity, long life, and reliable operation without overheating or excessive wear.
      b. Provide wiping action and means to prevent sticking due to fusion.
      c. Contacts carrying high inductive currents shall be provided with arc deflectors or suppressors.
   4. Microprocessor Hardware:
      a. Provide built-in noise suppression devices that provide a high level of noise immunity on all solid-state hardware and devices.
      b. Provide power supplies with noise suppression devices.
      c. Isolate inputs from external devices (such as pushbuttons) with opto-isolation modules.
      d. Design control circuits with one leg of power supply grounded.
      e. Safety circuits shall not be affected by accidental grounding of any part of the system.
      f. System shall automatically restart when power is restored.
      g. System memory shall be retained in the event of power failure or disturbance.
      h. Equipment shall be provided with Electro Magnetic Interference (EMI) shielding within FCC guidelines.
   5. Wiring:
      a. CSA labeled copper for factory wiring.
      b. Neatly route all wiring interconnections and securely attach wiring connections to studs or terminals.

c. Provide labels for all extra or spare wires, neatly organized at base of controller cabinet.

6. Permanently mark components (relays, fuses, PC boards, etc.) with symbols shown on wiring diagrams.
7. Provide controller with energy saving controls to reduce moving walk speed while idle.
8. Remote Monitoring and Diagnostics:
   a. Equip each controller with standard ports, interface boards, and drivers to accept maintenance, data logging, fault finding diagnostic, and monitoring system computers, keyboards, modems, and programming tools.
   b. The system shall be capable of driving remote color LED monitor(s) which continually scan and display the status of each moving walk.
9. Provide control panel compliant with UL 508A SB.SCCR of 5000A required.

E. Pallet Drive Assembly:
1. Direct or indirect drive.
2. Machine sprockets at each side over which pallet chains, pallet chain rollers, or steel cord reinforced polyurethane cog belt shall pass and transmit motion from machine to pallets.
3. If indirect chain drive is used between machine and drive sprocket, provide emergency brake on drive assembly to automatically set if drive chain fails.
4. Provide roller-type sealed bearings.

2.7 WELL-WAY EQUIPMENT

A. Truss:
1. Steel truss or stanchions to safely carry entire load of moving walk, including all components, full-capacity load and weight of exterior truss and balustrade covering material.
2. Provide required factor of safety.
3. Provide clearly identified exterior cladding support attachment locations on exposed sides and bottom of the entire length of truss.
4. Provide structural truss reinforcement as required for support to eliminate need for intermediate building supports.
5. Provide low friction material on lower landing bearing surfaces on trusses spanning expansion joints.

B. Truss Extensions Reductions:
1. Provide truss and access cover extensions at upper and/or lower landings as required and/or as shown on contract drawings to suit building structural support locations.

C. Truss Isolation:
1. Provide isolation pads at support locations to isolate truss and prevent transmission of vibration to building structure.

D. Drip Pans:
1. Oil-tight, steel pans with sufficient strength to withstand weight of workmen entire width and length of truss.

E. Pallet Tracks:
1. Construct from steel.
2. Tracks shall be bolted sections including transitions to facilitate maintenance and replacement if required.
3. Track sections, including transitions, shall be factory installed and aligned to ensure smooth, quiet operation of running gear under all conditions.

4. The individual track section, together with transition section, lower reversing station tension carriage, main drive shaft, and handrail drive shaft shall form a fully independent assembly.

F. Pallet Bands:
1. Lubrication free, Roller chain constructed of steel links with hardened pins or cast links connecting adjacent pallets and engaging pallet drive assembly.
2. Provide synthetic composition roller assemblies with sealed bearings.
3. Moving walk design shall permit pallet band inspection and operation while unit is running with pallets removed.

G. Pallet Guidance System:
1. Provide a pallet guidance system to control the horizontal and vertical movement of the pallets.

H. Exit Reversing Station Tension Carriage:
1. Fully independent, floating track system with spring tensioning device to maintain constant pallet band tension.

I. Pallet Assembly:
1. Single piece die-cast aluminum fastened to the pallet band.
2. Pallet rollers shall have sealed bearings and be tired with synthetic composition material.
3. Treads and riser shall be cleated.
4. Pallets shall be covered on the underside with sound-deadening material.
5. Pallets shall be removable from unit without disassembly of balustrade.
6. Paint pallet tread and riser black between machined surfaces of cleats.

J. Safety Devices:
1. Provide pallet and handrail safety devices.
    a. Broken drive train/pallet chain.
    b. Broken drive chain/drive belt.
    c. Skirt obstruction.
    d. Reversal stop.
    e. Pallet up-thrust.
    f. Handrail speed.
    g. Missing pallet.
    h. Pallet level.
    i. Handrail entry.
    j. Combplate impact.
    k. Pallet Demarcation Lights.
    l. Stop switch.

K. Electrical Wiring:
1. Conductors:
    a. Copper throughout with individual wires coded and all connections identified on studs or terminal blocks.
    b. Type SO cable may be utilized for wiring conducting 30 volts or less, per NEC 620-21.
    c. 31 Volt RMS or greater.
    d. Provide conduit, junction boxes, connections, and mounting means per requirements of Division 16.
    e. Provide painted or galvanized steel or aluminum conduit, conduit size minimum 3/8".
    f. Flexible conduit exceeding 18" in length shall not be used.

2.8 HANDRAILS

A. Construction:
1. Reinforced rubber running on metal guides.
2. Handrail shall be spliced and vulcanized with smooth joint.
3. Handrail shall be driven at the same speed as the pallets.
4. Provide tensioning device and slack-tension switch.

2.9 BALUSTRADE

A. Interior Panel:
1. Reinforced 14-gauge metal.

B. Skirt Panels:
1. Reinforced 14-gauge metal, if required by Contractor's own design.
2. Install to maintain loaded pallet gap clearance per code.
3. Provide panels with skirt brushes.
4. Extend skirt panel beyond combplates and wrap around base of newel.

C. Deck Boards:
1. Reinforced 14-gauge metal.
2. All deck section joints shall abut to provide a smooth surface to surface connection with butt joint or curved transition, top and bottom, horizontal to incline sections.

D. Newel Ends:
1. Continuous metal guides at upper and lower end of the balustrade, matching profile of handrail guides.
2. Newel end shall include a multi-roller bearing system to minimize friction and provide smooth return of handrail.

E. Finishes:
1. Interior Panels:
    a. Satin finish stainless steel reinforced vertical panels with section joints 90° to skirt inclined panel from skirt to handrail guide above.
2. Skirt Panels:
    a. Satin finish stainless steel.
3. Inner and Outer Deck:
    a. Satin finish stainless steel.

F. Trim and Moldings:
1. Match deck finish.

2.10 LANDINGS

A. Pallet Demarcation Lighting:
1. Provide minimum of two green fluorescent pallet demarcation lights within the pallet band at upper and lower landings.
2. Locate within a maximum of 16" from combplates.

B. Combplates:
1. Aluminum or other alloy provided with non-slip surface.
2. Provide removable comb sections.

C. Combplate Lighting:
1. Provide combplate lighting in skirt panel on both sides of units at both upper and lower landings.

D. Landing Plates:
1. Aluminum or other alloy with non-slip surface.
2. Plate shall extend from combplates to equipment access plates at upper and lower ends. Plates shall extend full width of truss.

E. Equipment Access Plates:
1. Aluminum or other alloy with non-slip surface.
2. Provide removable access plates to provide for entry into equipment spaces at upper and lower ends.
3. Plates shall cover entire truss openings.
4. Access plates shall match material and finish of adjacent landing plates.
5. Provide landing plate and access floor plate without visible manufacturer's name or logo.

2.11 SIGNAL AND CONTROL FIXTURES

A. Operating Station:
1. Provide upper and lower newel or stanchion mounted operating stations.
2. Mount on right side when facing unit.
3. Match deck finish.
4. Function and operating positions of switches and buttons shall be identified with engraved characters which are readily visible from a standing position.
5. Each station shall contain the following:
    a. Red "emergency stop" button.
        1) The button shall be covered with a transparent cover which can be readily lifted or pushed aside.
        2) When the cover is moved, an audible warning signal shall be activated.
        3) The signal shall have a minimum sound intensity of 80 dBA at the button location.
        4) The cover shall be engraved "EMERGENCY STOP"; "MOVE COVER" or equivalent legend (i.e. "LIFT COVER," "SLIDE COVER," etc.); and "PUSH BUTTON."
        5) "EMERGENCY STOP" shall be in letters not less than 1/2" (13mm) high.
        6) Other required wording shall be in letters not less than 3/16" (4.8mm) high.
        7) The cover shall be self-resetting.
    b. Key switch to "start" unit.
    c. Key directional control switch.

B. Fault Indicator:
1. Provide upper and lower end of truss with fault indicator to display source of fault without removal of equipment access plate.
2. Locate indicator in handrail inlet box or deck board visible from landing plate.

C. Diagnostic Access Port:
1. Provide upper and lower landings with RJ-11 diagnostic access port.

2.12 SIGNS

A. Landing Signs:
1. Provide caution signs at top and bottom landings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to beginning installation of equipment, examine well-way and pit areas.
   1. Verify no irregularities exist which affect execution of work specified.

B. Do not proceed with installation until work in place conforms to project requirements.

3.2 INSTALLATION

A. Install all equipment in accordance with Contractor's instructions, referenced codes, specification, and approved submittals.

B. Install all equipment so it may be easily removed for maintenance and repair.

C. Install all equipment for ease of maintenance.

D. Install all equipment to afford maximum accessibility, safety, and continuity of operation.

E. Remove oil, grease, scale, and other foreign matter from the following equipment and apply one coat of field-applied machinery enamel, for the following:
   1. All exposed equipment and metal work installed as part of this work which does not have architectural finish.
   2. Machine room equipment truss.
   3. Neatly touch up damaged factory-painted surfaces with original paint color or zinc-rich galvanizing compound.
   4. Protect machine-finish surfaces against corrosion.

F. Clean all architectural finishes and replace or restore any surfaces damaged during construction to like new condition.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing:
   1. On completion of moving walk installation and before permitting moving walk use, perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Operating Test:
   1. Load moving walk to rated capacity and operate continuously for 30 minutes over full travel distance.
   2. Record temperature rise of moving walk machine during 30-minute test period.
   3. Record failure to perform as required.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on moving walks.

3.4 ADJUSTING

A. Track Alignment:

1. Re-align factory installed tracks if required to ensure continuous 4-point contact with pallet and chain rollers.
2. Secure joints without gaps and file any irregularities to a smooth surface.

B. Lubricate all equipment in accordance with Contractor's instructions.

C. Adjust motors, brakes, controllers, stopping switches, and safety devices to achieve required performance levels.

D. Adjust brakes and controlled descent devices to stop moving walk with variable load.
1. Drive machine brakes shall stop the down running moving walk at a rate no greater than three feet/second^2.

E. Adjust handrail speed to coincide with pallet speed.

3.5 CLEANUP

A. Keep work areas orderly and free from debris during progress of project.

B. Remove packaging materials on a daily basis.

C. Remove all loose materials and filings resulting from work.

D. Clean machine room equipment, truss interior, and pit.

E. Clean balustrades, deck boards, skirt panels, operating and signal fixtures, and trim.

3.6 TEST RESULTS

A. Review procedure shall apply for individual moving walks, portions of groups of moving walks, and completed groups of moving walks accepted on an interim basis or moving walks and groups of moving walks completed, accepted, and placed into operation.

B. Contractor shall perform review and evaluation of all aspects of its work prior to requesting Consultant's final review. Work shall be considered ready for Consultant's final contract compliance review when all Contractor's tests are complete and all elements of work or a designated portion thereof are in place and moving walk or groups of moving walks are deemed ready for service as intended.

C. Furnish labor, materials, and equipment necessary for Consultant's review.
1. Notify Consultant a minimum of five working days in advance when ready for final review of moving walk or group.

D. Equipment and Instruments:
1. Furnish equipment and instruments to perform required tests.
2. The following instruments may be necessary to complete the tests:
   a. Multi meter.
   b. 500 Volt Megger.
   c. Alternating-current voltmeter and ammeter.
   d. Celsius-calibrated thermometers (two minimum).
   e. Precision tachometer.
   f. Decibel meter for noise test.

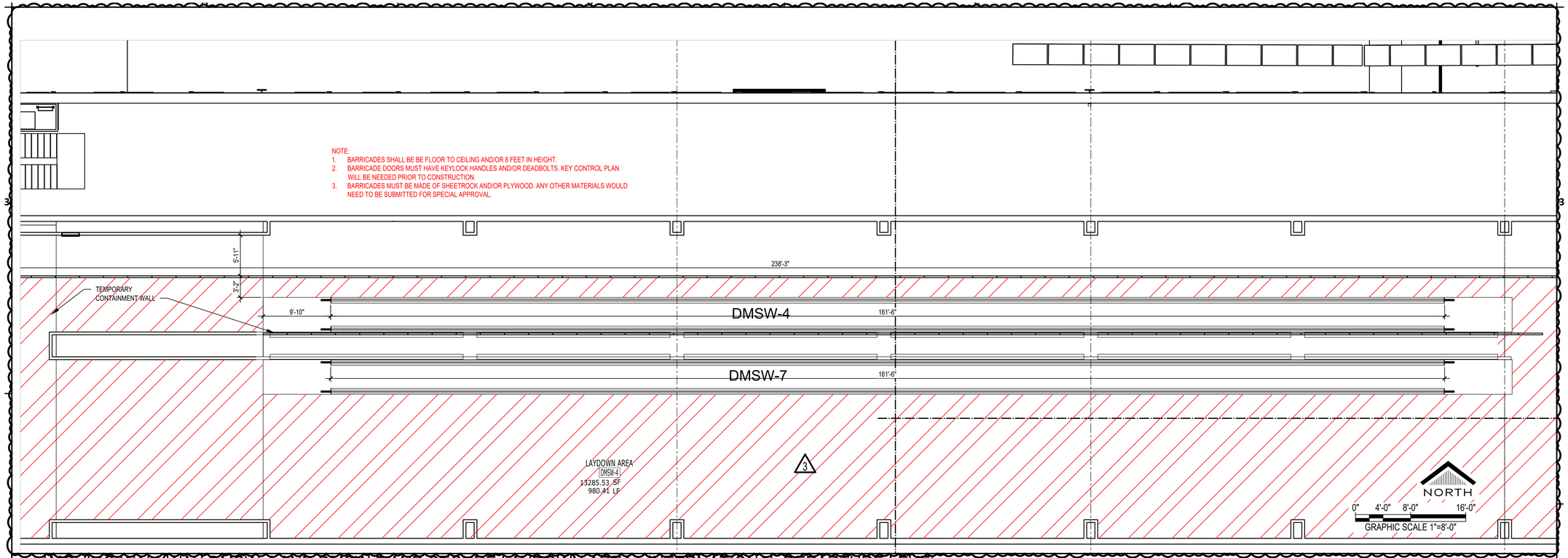
E. Consultant's written list of observed deficiencies of materials, equipment, and operating systems will be submitted to Contractor for corrective action.
   1. Consultant's review shall include as a minimum:
      a. Workmanship and equipment compliance with Contract Documents.
      b. Contract speed and performance comply with Contract Documents.
      c. Performance of following is satisfactory:
         1) Starting and running.
         2) Stopping.
         3) Controlled descent.
         4) Equipment noise levels.
         5) Signal and operating devices.
         6) Overall ride quality.
         7) Handrail speed.
         8) Operations of safety devices.
      d. Operating Tests:
         1) Overspeed Protection Device: Test by operating at rated speed, tripping overspeed device manually.
         2) Handrail-Tension Device: Test manually.
         3) Broken Drive Chain Devices: Test by operating at rated speed, tripping broken chain device manually.
   2. Test Results:
      a. In all test conditions obtain specified contract speed, handrail speed, controlled descent, performance, stopping, ride quality, and operation noise levels to satisfaction of Purchaser and Consultant.
      b. Temperature rise in motor windings limited to 50° Celsius above ambient.

F. Performance Guaranty:
   1. Should Consultant's review identify defects, poor workmanship, variance, or noncompliance with requirements of specified codes and/or ordinances, or variance or noncompliance with the requirements of Contract Documents, Contractor shall complete corrective work in an expedient manner to satisfaction of Purchaser and Consultant at no cost as follows:
      a. Replace equipment which does not meet code or Contract Document requirements.
      b. Perform work and furnish labor, materials, and equipment necessary to meet specified operation and performance.
      c. Perform retesting required by Governing Code Authority, Purchaser, and Consultant.

G. A follow-up final contract compliance review shall be performed by Consultant after notification by Contractor that all deficiencies have been corrected.
   1. Provide Consultant with copies of the initial deficiency report marked to indicate items which Contractor considers complete.

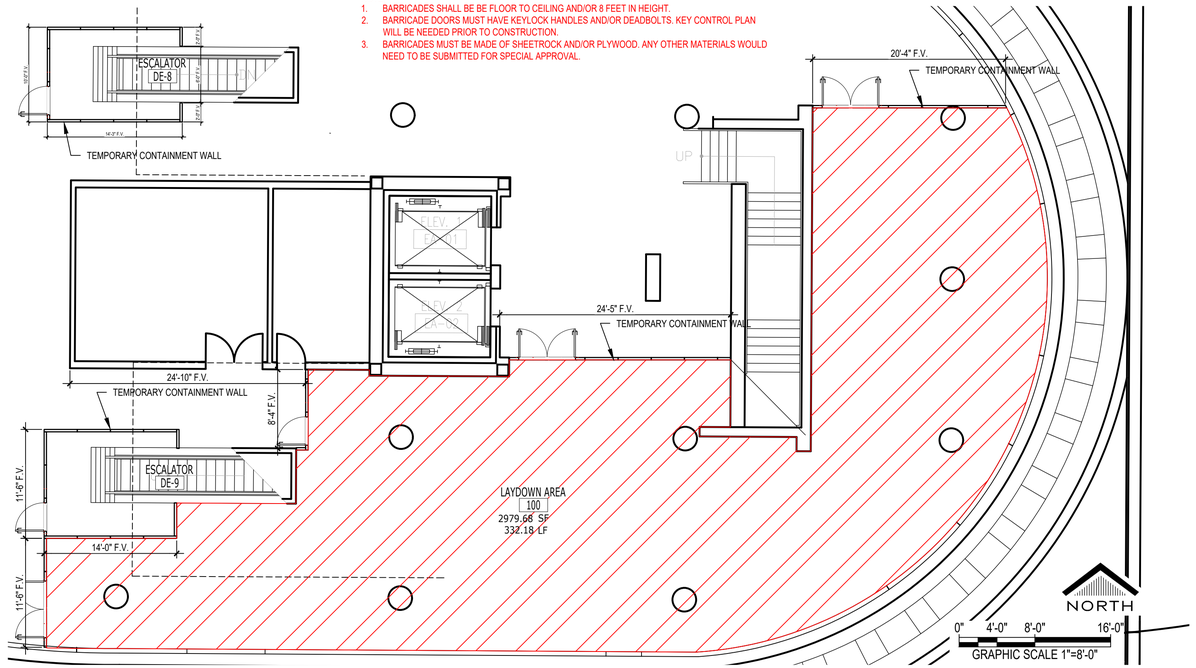
END OF SECTION

NOTE:
1. BARRICADES SHALL BE BE FLOOR TO CEILING AND/OR 8 FEET IN HEIGHT.
2. BARRICADE DOORS MUST HAVE KEYLOCK HANDLES AND/OR DEADBOLTS. KEY CONTROL PLAN WILL BE NEEDED PRIOR TO CONSTRUCTION.
3. BARRICADES MUST BE MADE OF SHEETROCK AND/OR PLYWOOD. ANY OTHER MATERIALS WOULD NEED TO BE SUBMITTED FOR SPECIAL APPROVAL.



04 MOVING WALKWAY DMSW-4 AND DMSW-7 AND SECURE LAYDOWN AREA - INTERNATIONAL DEPARTURE LEVEL
1/8" = 1'-0"

NOTE:
1. BARRICADES SHALL BE BE FLOOR TO CEILING AND/OR 8 FEET IN HEIGHT.
2. BARRICADE DOORS MUST HAVE KEYLOCK HANDLES AND/OR DEADBOLTS. KEY CONTROL PLAN WILL BE NEEDED PRIOR TO CONSTRUCTION.
3. BARRICADES MUST BE MADE OF SHEETROCK AND/OR PLYWOOD. ANY OTHER MATERIALS WOULD NEED TO BE SUBMITTED FOR SPECIAL APPROVAL.



01 UNSECURE LAYDOWN AND STAGING AREA LOCATED AT TRAIN LEVEL BASEMENT BETWEEN TERM D AND FIS
1/8" = 1'-0"

02 GENERAL NOTES
1' = 1'-0"

1. DELIVERIES CAN MADE TO THE TERMINAL C LOADING DOCK, UTILIZING C13 FREIGHT ELEVATOR.
2. THE ACCESS PATH FROM THE UNLOADING POINT TO THE LOCATION **OF EACH PIECE OF EQUIPMENT WILL** ALLOW FOR THE MOVEMENT OF EQUIPMENT SIZED 12 FOOT LONG, 4 FOOT WIDE AND WEIGHING LESS THAN 8000 LBS.
3. TO REMOVE GLASS WINDOWS / ETC. IN CLOSE PROXIMITY TO THE EQUIPMENT TO PROVIDE CLOSER ACCESS FOR DELIVERIES WILL REQUIRE AN AMENDMENT TO THE ASP WITH A SECURITY PLAN FOR TSA TO REVIEW AND APPROVE. CONTRACTOR SHALL COORDINATE WITH HAS SECURITY IN ADVANCE OF PROJECT TO PROVIDE TSA A 45-DAY NOTICE TO REVIEW ALL ASP AMENDMENTS.
4. WEATHER PROTECTED STORAGE LOCATION FOR OVERFLOW DELIVERIES FOR EACH UNIT ARE AS SHOWN ON THIS SHEET. ONE IS IN AN UNSECURED AREA, AND THE OTHER IN THE SECURED AREA OF THE TERMINAL. CONTRACTOR TO PROVIDE OFF SITE STORAGE OF EQUIPMENT THAT WILL NOT FIT IN THESE STORAGE AREAS.
5. THE CLOSEST LOCATION FOR DISPOSAL DUMPSTERS AND / OR CONNEX STORAGE BOXES TO THE MOST CONVENIENT ACCESS POINT IS TO BE DETERMINED, BUT STORAGE WILL BE LIMITED TO WHAT IS SHOWN ON THIS PAGE, IN TERMINAL D.
6. ALL WORK SHALL BE PREFORMED AFTER HOURS (10 PM TO 6 AM) UNLESS PERMISSION IS OBTAINED FROM HAS PRIOR TO PERFORMING THE WORK.
7. ALL MAJOR MOVEMENT OF MATERIALS/WORK WILL ONLY OCCUR DURING THE THIRD SHIFT BETWEEN 10:00PM AND 6:00AM.
8. MATERIAL AND EQUIPMENT DELEVERIES SHALL BE INSPECTED BY SECURITY AND DOG SWEEP. THIS INSPECTION SHALL BE SCHEDULED AND WILL NEED TO TAKE PLACE PRIOR TO 8PM. THE INSPECTED MATERIAL WILL NEED TO BE SECURE UNDER CONSTANT WATCH PRIOR TO PLACEMENT INSIDE THE SECURE TERMINAL LAY DOWN AREA.
9. TSA DIRECTIONS REQUIRE SOLID BARRICADES MADE OF SHEETROCK AND/OR PLYWOOD (FLOOR TO CEILING AND/OR EIGHT FEET IN HEIGHT). OTHER WALL MATERIALS CAN BE APPROVED BUT MUST BE SUBMITTED FOR REVIEW. ANY DOORS IN BARRICADES MUST BE SECURED WITH KEY-LOCKS W/KEYS CONTROLLED BY THE CONTRACTOR. DOORS MUST HAVE DOUBLE KEYLOCK HANDLES AND/OR DEADBOLTS. KEYS WILL BE RESTRICTED TO PROJECT MANAGERS AND/OR SECURED INSIDE A LOCKED ONSITE COMBO-BOX. CONTRACTOR WILL PROVIDE HAS SECURITY THE NAME OF PERSON(S) IN POSSESSION OF KEY(S) PRIOR TO STARING PROJECT AND MUST NOTIFY HAS SECURITY OF ANY CHANGE AFTER COMMENCEMENT AND WILL IMMEDIATELY NOTIFY HAS SECURITY IF A KEY IS LOST AND/OR UNACCOUNTED, AND RE-CORE LOCK. CONTRACTOR WILL CHANGE CODE TO COMBO-BOX (IF APPLICABLE/IN-USE) IN EVENT PARTY WITH ACCESS IS SEPARATED AND NOTIFY HAS. IF COMBO-BOX IS USED, CODE MUST BE CHANGED OFTEN. ALL KEYS ARE SUBJECT TO HAS SECURITY AUDIT. PRIOR TO CONSTRUCTION, CONTRACTOR WILL SUBMIT AN AMENDMENT TO OUR ASP FOR THE TSA FSD'S OFFICE TO APPROVE BARRICADE LOCATIONS IN THE POST-TSA-SCREENED STERILE-AREA
10. THERE WILL BE COSTS ASSOCIATED WITH BADGING. THE CONTRACTOR WILL REQUIRE COORDINATING REQUIREMENTS WITH HAS.
11. ELECTRICAL MODIFICATIONS ARE INCLUDED IN THE GC SCOPE OF WORK DUE TO THE INCREASE IN ESCALATOR STEP LOADING.
12. A GROUND WIRE SHALL BE PRESENT FOR EACH PIECE OF EQUIPMENT AT THE DISCONNECT. THE CONTRACTOR SHALL INSTALL THIS REQUIREMENT TO THE ELECTRICAL SCOPE OF WORK.

HOUSTON AIRPORTS

IAH TERMINAL D CONVEYANCE REPLACEMENT - 2800 N TERMINAL RD, HOUSTON, TX 77032

IAH TERMINAL D CONVEYANCE REPLACEMENT

C.I.P. No.	A.I.P. No.
C.O.H. No.	D.O.A No.

MWA ARCHITECTS
11767 KATY FREEWAY SUITE 430
HOUSTON, TEXAS 77079 - 713-482-2338

DESIGNER PROJECT No.:	23-08
PROJECT STATUS:	ISSUED FOR ADDEN-06

REVISIONS

No.	DESCRIPTION	DATE	BY
1	ISSUED FOR ADDEN-03	06/06/2023	
2	ISSUED FOR PERMIT REVISION	11/27/2023	J TOHILL
3	ISSUED FOR ADDEN-06	04/05/2024	J TOHILL
4			
5			
6			
7			
8			
9			

DESIGNER:	J TOHILL
DRAWN BY:	J TOHILL
CHECKED BY:	TBD
ISSUE DATE:	04/05/2024
APPROVED BY:	
APPROVAL DATE:	

DIRECTOR
of
HOUSTON AIRPORT SYSTEM

Review/ Approval Category
IFP
ISSUED FOR ADDEN-06

REGISTERED ARCHITECT · NOE ALVARADO · 22651 · STATE OF TEXAS
04/05/2024

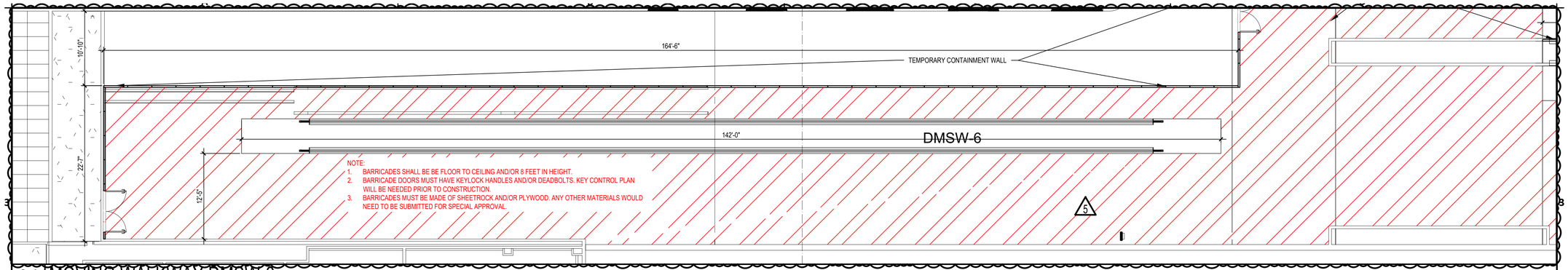
NORTH

SHEET NAME:
UNSECURE AND SECURE LAYDOWN AREAS

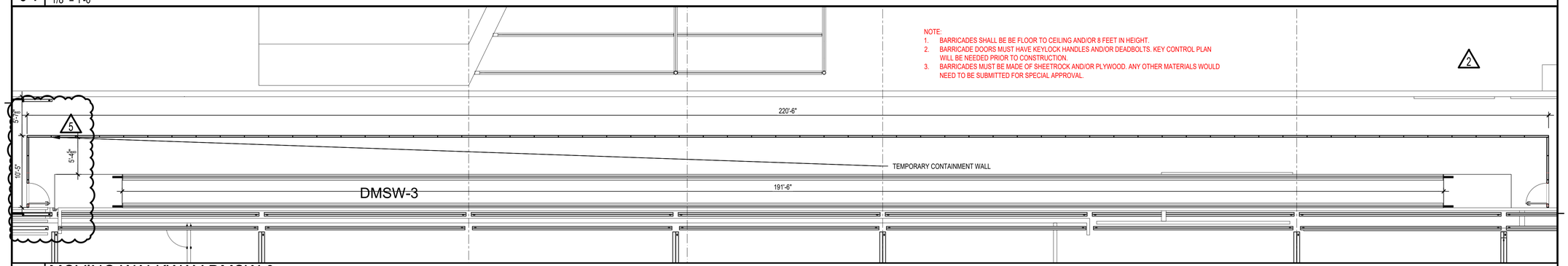
SHEET No.	SCALE:
A3-04	

SHEET SIZE: 22"x34" ANSI-D

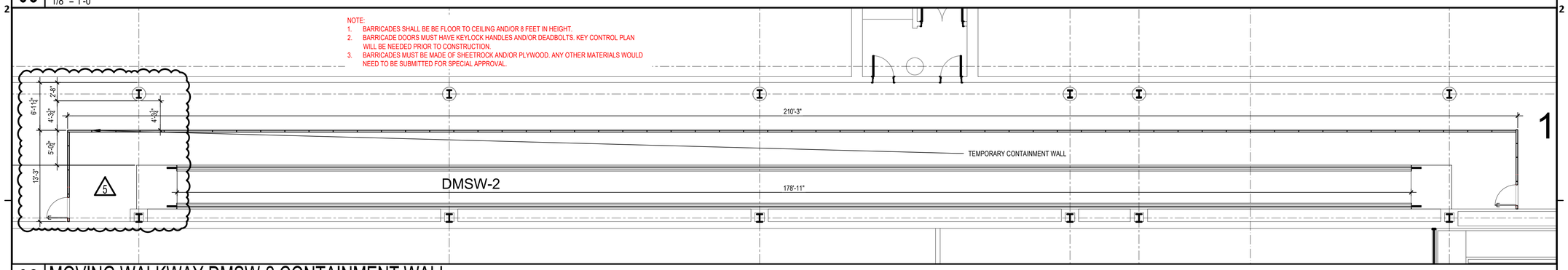
F:\2023\23-08 HAS IAH TD CONVEYANCE SYSTEM MODERNIZATION\DWGS\A3-04 UNSECURE AND SECURE LAYDOWN AREAS.DWG
PLOT DATE: 5 April 2024 4:16:40 PM
OLD DOA No.:
DOA DWG FILE:
FILE PATH:



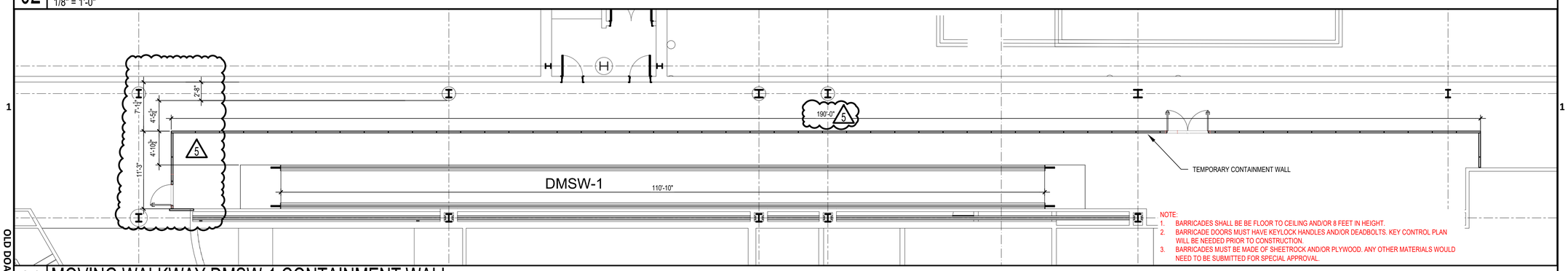
04 MOVING WALKWAY DMSW-6
1/8" = 1'-0"



03 MOVING WALKWAY DMSW-3
1/8" = 1'-0"



02 MOVING WALKWAY DMSW-2 CONTAINMENT WALL
1/8" = 1'-0"



01 MOVING WALKWAY DMSW-1 CONTAINMENT WALL
1/8" = 1'-0"

HOUSTON AIRPORTS

IAH TERMINAL D CONVEYANCE REPLACEMENT - 2800 N TERMINAL RD, HOUSTON, TX 77032

IAH TERMINAL D CONVEYANCE REPLACEMENT

C.I.P. No.	A.I.P. No.
C.O.H. No.	D.O.A No.

MWA ARCHITECTS
11767 KATY FREEWAY SUITE 430
HOUSTON, TEXAS 77079 - 713-482-2338

DESIGNER PROJECT No.:	23-08
PROJECT STATUS:	ISSUED FOR ADDEN-06

REVISIONS

No.	DESCRIPTION	DATE	BY
0	ISSUED FOR PERMIT	05/10/2023	J TOHILL
1	ISSUED FOR BID	05/16/2023	J TOHILL
2	ISSUED FOR ADDEN-03	06/06/2023	
4	ISSUED FOR PERMIT REVISION	11/27/2023	J TOHILL
5	ISSUED FOR ADDEN-06	04/05/2024	J TOHILL

DESIGNER:	J TOHILL
DRAWN BY:	J TOHILL
CHECKED BY:	TBD
ISSUE DATE:	04/05/2024
APPROVED BY:	
APPROVAL DATE:	

DIRECTOR
of
HOUSTON AIRPORT SYSTEM

Review/ Approval Category
IFP
ISSUED FOR ADDEN-06

REGISTERED ARCHITECT ☆ NOE ALVAREZ ☆ 22651 ☆ STATE OF TEXAS
04/05/2024

NORTH

SHEET NAME: MOVING WALKWAYS

SHEET No.	SCALE:
A3-03	

SHEET SIZE: 22"x34" ANSI-D

F:\2023\23-08 HAS IAH TD CONVEYANCE SYSTEM MODERNIZATION\DWGS\A3-03 MOVING WALKWAYS.DWG
PLOT DATE: 5 April 2024 4:16:20 PM
OLD DOA No. :
DOA DWG FILE:
FILE PATH:

GENERAL NOTES:

1. The drawings are diagrammatic in nature and were made from the best information available. Confirm all locations and dimensions in the field. Visit the site prior to bid. The contractor will be responsible for the conditions as they exist and no additional costs will be allowed for readily observable conditions.
2. Guarantee labor and materials for 1 year.
3. All new or additional power distribution equipment shall be the same manufacturer as the original building equipment and shall be provided with black, phenolic nameplates with white letters (min. 5/16" ht.). panelboards shall be embossed or engraved metal nameplate to indicate voltage, phase, bussing, and short circuit bracing. supply new, accurate panel directories for each panel board or distribution panel in which any work is performed. Equipment requiring servicing must have GFCI protection per NEC 210.63. Provide new breakers in existing spaces as required for this installation. breakers for abandoned circuits shall be labeled "spares".
4. Reused electrical equipment, wiring devices, siring device cover plated, conduit and wire which are damaged shall be restored to original integrity. all materials used for repairs shall meet original specifications. abandoned electrical, data, or communications elements shall be removed back to original source and returned to landlord. refer to data and telephone contractor for coordination.
5. Any electrical work affecting the lighting on the AOA must be coordinated with IAH electrical department.
6. For all telephones/data outlets, provide an opening, plaster ring, and device plate at normal receptacle height unless otherwise indicated and a pullstring to the accessible ceiling space above. Where the wall is located below an inaccessible ceiling space, provide a 4" square junction box with a single device plaster ring mounted flush with finished wall at normal receptacle height, unless otherwise noted. All telecommunication conduit to be 1" minimum and routed to IDF room and/or to above cable tray with bushing.
7. Electrical contractor shall field verify all circuit designations and shall make corrections as needed.
8. All fire alarm system devices and exit signage shall be interfaced with building fire alarm system. All new devices shall be fully compatible with the existing fire alarm system. Fire alarm system contractor shall verify location and quantity of fire alarm system initiating, automatic initiating and audible devices as required by existing building system. Provide additional fire alarm signaling devices as required to insure adequate coverage throughout the lease area. Additional fire alarm devices shall be added to meet building standards and fire alarm system code requirements. All Fire Alarms related work including fire alarm system shutdowns, must be coordinated with Owner.
9. The contractor is responsible for compliance with HAS construction requirements. Work that interferes with existing tenant or building activities may require special time. The electrical contractor shall coordinate special time with building management and include these costs in his bid proposal.

10. All work shall comply with the FAA, Local Building, Plumbing, and Mechanical codes, NFPA 90A, 70 and any other applicable codes. Electrical work must comply with NEC-2020, City Electric Code, and HAS-Electric Standards. Base Building Standards and Specifications shall apply to all work shown on these drawings. If any conflict between any code requirements arises, use the most restrictive
11. All locations of devices are approximate. See architectural drawings for exact locations.
12. Seal all new or existing penetrations in of floors, rated partitions, and corridor walls.
13. Secure all permits and provide any required temporary utilities.
14. All work and service interruptions shall be coordinated with the owner such that the work is performed at the owners convenience. This may be during evenings and weekends.
15. Contractor to provide "as-built" drawings indicating the configuration of the constructed work.
16. Repair any damage that occurs to any electrical equipment during demolition.
17. Submit information on all new equipment in the form of shop drawings. Refer to architectural specifications for the correct procedure.
18. Provide 3 copies of the operation and maintenance manuals to the owner. Provide instruction on the system operation to the owner.
19. As per 2020 NEC and all HAS standards All panels, disconnects, transformers shall have phenolic tags stating electrical room, circuit number and voltage with arc flash stickers. Where applicable, all receptacles on tables or bar area shall be GFCI protected. conduits crossing expansion joints shall have expansion fitting per NEC.
20. Wiring – All wiring shall be copper, minimum size #12 AWG, THWN, rated at 600 volts. Provide green grounding conductor with all power and receptacle circuits. All wiring to be in conduit. Lighting fixtures must have individual feeds to each fixture,"daisy chaining" of fixtures is not allowed. Lighting fixture whips must be 6 feet long or less.

NO AC (BX) OR MC CABLE ALLOWED.
ALL GROUND RODS TO BE STAINLESS STEEL.
ALL BONDING AND GROUNDING PER 250 OF 2020 NEC AND ALL HAS 2020 STANDARDS.
ALL UNUSED CONDUIT AND WIRING OF ANY CRAFT SHALL BE REMOVED BACK TO ITS SOURCE.
ALL ELECTRICAL WORK MUST PASS INSPECTION PRIOR TO BACKFILL, CONCRETE PLACEMENT, INSULATION OR COVER(WALL OR CEILING).

21. Boxes – All boxes to be galvanized steel suitable for location and sized per the N.E.C. and supported separately from conduit.
22. Devices: Switches – Single pole, 3-way and 4-way switches to be 20 amp., 120/240 or 277/480 volt as applicable. Mount switches as shown on plan. Switches and device plates shall be white in color, unless noted otherwise. Hubbell #1121I or equal Receptacles – Commercial grade 20 amp., 120v., NEMA 5-20R, Hubbell 5262I or equal. Install receptacles as shown on plan. Receptacles and device plates shall be white in color, unless noted otherwise. Isolated ground receptacles to be orange Hubbell 1121I or equal. Floor box with Brass carpet flange shall be Hubbell B2536 or equal.
23. Conduit – Conduit shall be 3/4" minimum galvanized EMT w/ compression fittings. Support conduit from structure, not to exceed 10' between supports. Do not support from ductwork or piping. Route conduit as directly as possible with large radius bends and installed per N.E.C. Provide U.L. Listed expansion fittings if conduit crosses Expansion
or Deflection Joint. Clean conduit interior after installation, coat scratches with zinc paint. Provide pull wire for all empty conduit. Conduit under slab shall be schedule 40 PVC. All conduit shall be concealed in the sales areas. Any conduit passing through the floor shall be rigid galvanized steel conduit. All floor penetrations shall be inspected for fire caulking by BSG electrical inspectors before covering.
24. Conductors:

A. Minimum wire size for branch circuits be No. 12 AWG copper.
   a. No. 14 AWG may be used for control circuit wiring when over current protection is provided in compliance with the applicable NEC, NFPA and JIC standards.
   b. No. 14 AWG or No. 16 AWG may be used for "fixture whips" for individual fixtures when using individual fuse protection for each fixture.
B. Aluminum wire shall be used only for overhead spans from pole to pole, pole to building, or building to building applications.
C. Stranded wire smaller than No. 8 AWG may be for branch circuits providing:
   a. They are connected to wiring devices that utilize clamp type terminations rather than binder head screw connections.
   b. They are terminated with spade type lugs for binder head screw connections.
   c. They are spliced to solid conductors for binder head screw connections.
D. Stranded conductors shall be used for all motor and control circuit wiring.
E. Conductors feeding computer outlets (or in close proximity to a telecommunications outlet) shall have a neutral one size larger than the phase conductor.
F. Required torque to terminals in breakers 100A and above must be witnessed by HAS/BSG Electrical inspectors.
G. Conduct color coding shall be consistent along the entire length of a circuit. Color coding shall be as follows:

480Y / 277V, 3ø, 4W	208Y / 120V, 3ø, 4W	240Y / 120V, 1ø, 3W
A# – Brown	A# – Black	A# – Black
B# – Purple	B# – Red	C# – Red
C# – Yellow	C# – Blue	N – White
N – Gray	N – White	Grnd – Bare
Grnd – Bare	Grnd – Bare	Iso Grnd – Green
Iso Grnd – Green	Iso Grnd – Green	

SYMBOL LEGEND

SWITCHES

- SWITCH, SPST, 20A, 120/277V
- S_3 SWITCH, 20A, 120/277V, "2" DENOTES DPST, "3" DENOTES THREE-WAY, "4" DENOTES FOUR-WAY
- S_D DIMMER CONTROL SWITCH, 1000 WATT UNLESS OTHERWISE NOTED.
- ALL WIRES SHALL BE NEUTRAL, HOT, GROUND AND SWITCH LEG. UNLESS OTHERWISE SHOWN.
- UNDER GROUND CONDUIT

RECEPTACLES AND OUTLETS

- DUPLEX WALL RECEPTACLE, NEMA 5-15R, 15A, 125V OR NEMA 5-20R, 20A, 125V, RE: SPECIFICATIONS, DOT INDICATES ABOVE COUNTER.
- WP DUPLEX WALL RECEPTACLE. "WP" DENOTES WEATHERPROOF, "TP" DENOTES SAFETY TYPE, "GFI" DENOTES GROUND FAULT PROTECTION. DOT INDICATES ABOVE COUNTER.
- FOURPLEX WALL RECEPTACLE. NEMA 5-15R, 15A, 125V. DOT INDICATES ABOVE COUNTER.
- SPECIAL RECEPTACLE, NEMA CONFIGURATION AS NOTED. DOT INDICATES ABOVE COUNTER.
- JUNCTION BOX
- DIRECT CONNECTION TO EQUIPMENT.
- DATA OUTLET. PROVIDE 2"X4" OUTLET BOX WITH 1" CONDUIT AND PULL STRING TO ABOVE CEILING.
- TELEPHONE OUTLET. PROVIDE 2"X4" OUTLET BOX WITH 1" CONDUIT AND PULL STRING TO ABOVE CEILING.

ELECTRICAL EQUIPMENT

- DISTRIBUTION PANEL
- PLYWOOD TERMINAL BOARD, TYPE AS NOTED, 4' X 8' X 3/4" UNLESS NOTED OTHERWISE
- T TRANSFORMER

MOTORS AND CONTROLS

- SINGLE OR THREE PHASE MOTOR
- DISCONNECT (SAFETY) SWITCH "200/3/150" DENOTES AMPERES/POLE/FUSE, "NF" DENOTES NON-FUSED
- MOTOR STARTER
- COMBINATION DISCONNECT (SAFETY) SWITCH AND MOTOR STARTER, "30/3/15/#0" DENOTES AMPERES/POLES/FUSE/ STARTER SIZE, "NF" DENOTES NON-FUSED.
- S_m MANUAL MOTOR STARTING WITH THERMAL OVERLOAD

GENERAL NOTE:

PROVIDE UNIT PRICING FOR WIRE AND CONDUIT TO COMPLETE GROUNDING REQUIREMENTS PER NEC 2023 FOR ELEVATORS, MOVING WALKWAYS AND ELEVATORS.

1

HOUSTON AIRPORTS

IAH TERMINAL D CONVEYANCE REPLACEMENT - 2800 N TERMINAL RD, HOUSTON, TX 77032

IAH TERMINAL D CONVEYANCE REPLACEMENT

C.I.P. No.	A.I.P. No.
C.O.H. No.	D.O.A No.

MWA ARCHITECTS
11767 KATY FREEWAY SUITE 430
HOUSTON, TEXAS 77079 - 713-482-2338

DESIGNER PROJECT No.:	23-08
PROJECT STATUS:	ISSUE FOR CONSTRUCTION

REVISIONS

No.	DESCRIPTION	DATE	BY
0	ISSUED FOR PERMIT	05/16/2023	
1	ADD. #6	04/09/2024	

DESIGNER:	JE
DRAWN BY:	JE
CHECKED BY:	JE
ISSUE DATE:	11/28/2023
APPROVED BY:	
APPROVAL DATE:	

DIRECTOR
of
HOUSTON AIRPORT SYSTEM

Review/ Approval Category

IFC

ISSUED FOR CONSTRUCTION

N. CURTIS JONES, JR. 58428 REGISTERED PROFESSIONAL ENGINEER 74942 11/28/2023

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY N. CURTIS JONES, JR, P.E. 58428

TERMINAL "D"

SHEET NAME:
ELECTRICAL DETAILS

SHEET No.	SCALE:
E3.01	

JONES ENGINEERS, L.P.
Consulting Mechanical/Electrical/Plumbing Engineers
9820 Whithorn Dr. Houston, Texas 77095 (713)222-7766
Texas Registered Engineering Firm #F-3811

SHEET SIZE: 22"x34" ANSI-D

FILE PATH: Y:\4900'S\4942 - HAS IAH TERMINAL D CONVEYANCES\DWGS\4942 - E101.DWG

PLOT DATE: 16 April 2024 12:10:13 PM

OLD DOA No.: :
DOA DWG FILE:

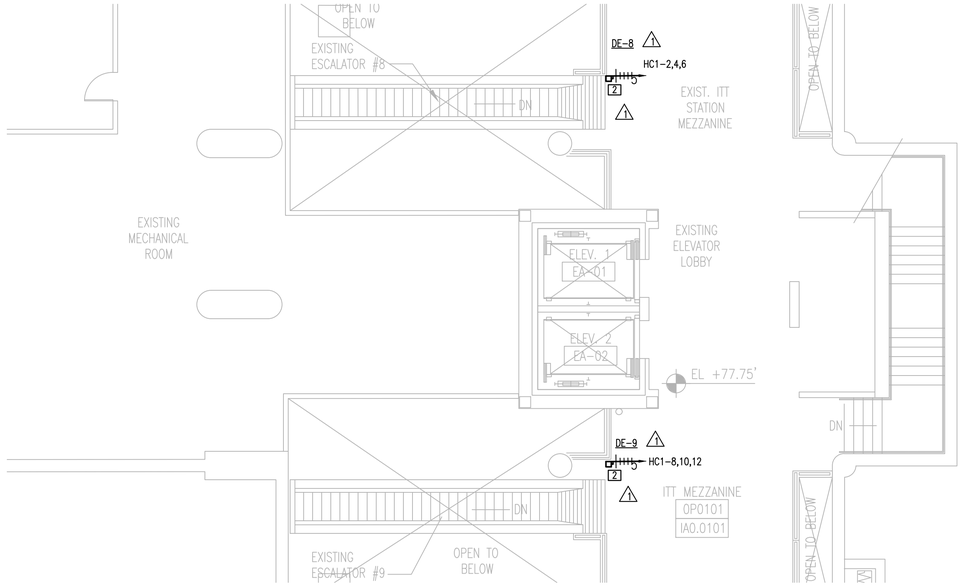
GENERAL PLAN NOTES

1. ALL WORK PER 2020 NEC AND ALL HAS STANDARDS.
2. ALL NEW ELECTRICAL DEVICE LOCATIONS ARE APPROXIMATE. FOR EXACT LOCATION REFER TO ARCHITECTURAL DRAWINGS.
3. ALL EXISTING ELECTRICAL DEVICES ARE EXISTING TO REMAIN, UNLESS NOTED OTHERWISE.
4. ANY UNUSED / DEMOLISHED CIRCUITS TO BE REMOVED COMPLETE TO PANEL, INCLUDING ALL WIRE, CONDUIT AND ASSOCIATED DEVICES. UPDATE PANEL SCHEDULE TO SHOW AS 'SPARE'.
5. ALL UPDATED PANEL SCHEDULES TO TYPED AND FULLY LEGIBLE.
6. COORDINATE WITH ARCHITECTURAL AND STRUCTURAL FOR ALL FLOOR CORES. ALL CORES TO BE FULLY X-RAYED AND REVIEWED BY HAS.
7. ALL FLOOR BOXES (FLUSH) WILL REQUIRE GFCI PROTECTION PER HAS ELECTRICAL STANDARDS.
8. ALL 120V CIRCUIT LENGTHS OVER 75 FEET TO BE #10 AWG.
9. 4.CONDUIT CROSSING ANY EXPANSION OR DEFLECTION JOINT SHALL USE UL LISTED EXPANSION FITTINGS PER HAS STANDARDS AND NEC.
10. VERIFY CIRCUITING OF ALL EXISTING RELOCATED DEVICES PRIOR TO WORK.
11. ALL RECEPTACLES TO BE LABELED WITH PANEL AND CIRCUIT NUMBER PER HAS STANDARDS.
12. REPLACE OR PROVIDE NEW J-BOX COVERS FOR ANY OPEN EXISTING J-BOX IN AREA OF WORK.
13. PROVIDE ELECTRICIAN TO INSPECT PANELS FOR EXISTING GROUNDING CONDITIONS.
14. PROVIDE GROUND WIRE IN EXISTING CONDUIT FOR ELEVATORS, ESCALATORS, AND MOVING WALKWAYS

PLAN KEYNOTE

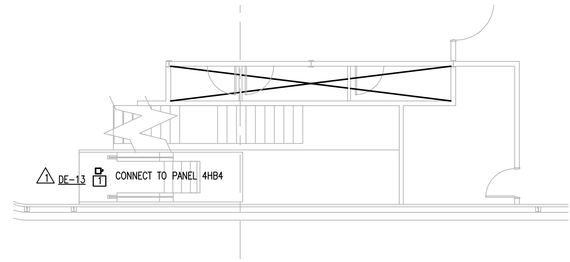
1 EXISTING CONDUIT TO REMAIN, EXISTING WIRE TO BE REMOVIED BACK TO PANEL. REFER TO PANEL SCHEDULE FOR NEW WIRE SIZE. DISCONNECT TO BE FURNISHED BY ESCALATOR/MOVING WALKWAY MANUFACTURER.

2 EXISTING WIRE AND CONDUIT TO BE RE-USED. DISCONNECT TO BE FURNISHED BY ESCALATOR/MOVING WALKWAY MANUFACTURER.



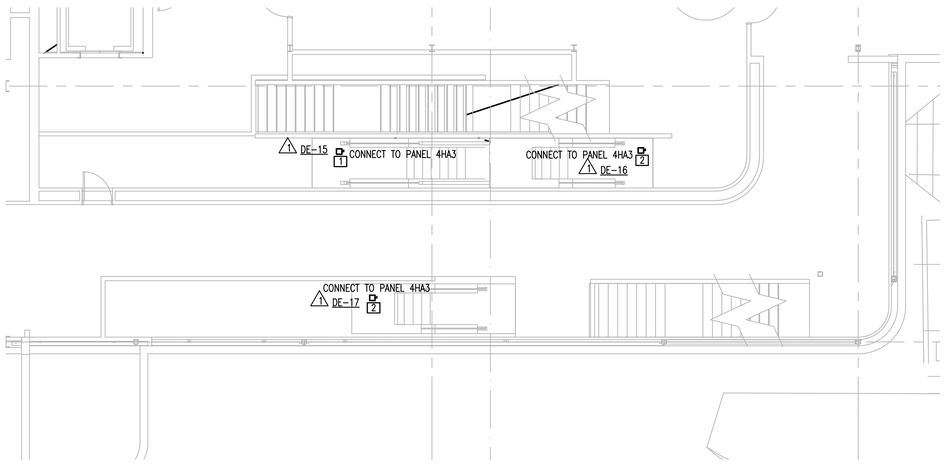
01 - ELECTRICAL POWER PLAN - ESCALATORS 8 & 9

SCALE: 1/8" = 1'-0"



02 - ELECTRICAL POWER PLAN - ESCALATOR 13

SCALE: 1/8" = 1'-0"



03 - ELECTRICAL POWER PLAN - ESCALATORS 15, 16, & 17

SCALE: 1/8" = 1'-0"

HOUSTON AIRPORTS

IAH TERMINAL D CONVEYANCE REPLACEMENT - 2800 N TERMINAL RD, HOUSTON, TX 77032

IAH TERMINAL D CONVEYANCE REPLACEMENT

C.I.P. No.	A.I.P. No.
C.O.H. No.	D.O.A No.

MWA ARCHITECTS
11767 KATY FREEWAY SUITE 430
HOUSTON, TEXAS 77079 - 713-482-2338

DESIGNER PROJECT No.:	23-08
PROJECT STATUS:	ISSUE FOR CONSTRUCTION

REVISIONS

No.	DESCRIPTION	DATE	BY
0	ISSUED FOR PERMIT	05/16/2023	
1	ADD. #6	04/09/2024	

DESIGNER:	JE
DRAWN BY:	JE
CHECKED BY:	JE
ISSUE DATE:	11/28/2023
APPROVED BY:	
APPROVAL DATE:	

DIRECTOR
of
HOUSTON AIRPORT SYSTEM

Review/ Approval Category
IFC
ISSUED FOR CONSTRUCTION

N. CURTIS JONES, JR. 58428 REGISTERED PROFESSIONAL ENGINEER 4942 11/28/2023
THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY N. CURTIS JONES, JR, P.E. 58428

TERMINAL "D"

SHEET NAME:
ELECTRICAL FLOOR PLANS

SHEET No.	SCALE:
E2.01	

JONES ENGINEERS, L.P.
Consulting Mechanical/Electrical/Plumbing Engineers
9820 Whithorn Dr. Houston, Texas 77095 (713)222-7766
Texas Registered Engineering Firm #F-3811

GENERAL PLAN NOTES

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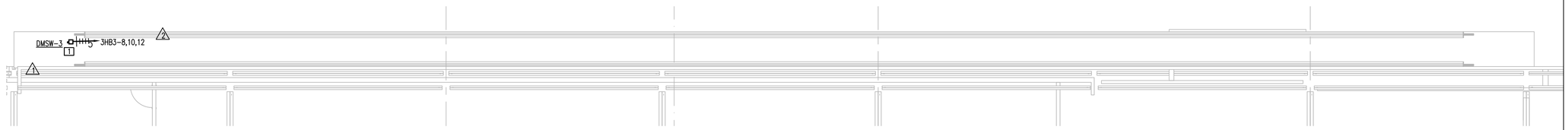
3. ALL EXISTING ELECTRICAL DEVICES ARE EXISTING TO REMAIN, UNLESS NOTED OTHERWISE.
4. ANY UNUSED / DEMOLISHED CIRCUITS TO BE REMOVED COMPLETE TO PANEL, INCLUDING ALL WIRE, CONDUIT AND ASSOCIATED DEVICES. UPDATE PANEL SCHEDULE TO SHOW AS 'SPARE'.
5. ALL UPDATED PANEL SCHEDULES TO TYPED AND FULLY LEGIBLE.
6. COORDINATE WITH ARCHITECTURAL AND STRUCTURAL FOR ALL FLOOR CORES. ALL CORES TO BE FULLY X-RAYED AND REVIEWED BY HAS.
7. ALL FLOOR BOXES (FLUSH) WILL REQUIRE GFCI PROTECTION PER HAS ELECTRICAL STANDARDS.
8. ALL 120V CIRCUIT LENGTHS OVER 75 FEET TO BE #10 AWG.
9. 4.CONDUIT CROSSING ANY EXPANSION OR DEFLECTION JOINT SHALL USE UL LISTED EXPANSION FITTINGS PER HAS STANDARDS AND NEC.
10. VERIFY CIRCUITING OF ALL EXISTING RELOCATED DEVICES PRIOR TO WORK.
11. ALL RECEPTACLES TO BE LABELED WITH PANEL AND CIRCUIT NUMBER PER HAS STANDARDS.
12. REPLACE OR PROVIDE NEW J-BOX COVERS FOR ANY OPEN EXISTING J-BOX IN AREA OF WORK.
13. PROVIDE ELECTRICIAN TO INSPECT PANELS FOR EXISTING GROUNDING CONDITIONS.
14. PROVIDE GROUND WIRE IN EXISTING CONDUIIT FOR ELEVATORS, ESCALATORS, AND MOVING WALKWAYS

PLAN KEYNOTE

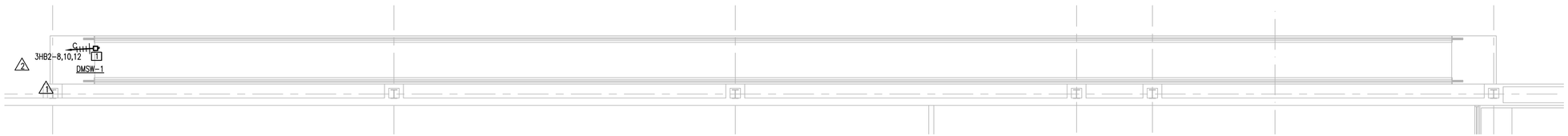
1. EXISTING CONDUIT AND WIIRE TO BE REMOVIED BACK TO PANEL. TO BE FURNISHED BY ESCALATOR/MOVING WALKWAY MANUFACTURER.
2. EXISTING WIRE AND CONDUIT TO BE RE-USED. DISCONNECT TO BE FURNISHED BY ESCALATOR/MOVING WALKWAY MANUFACTURER.

1 DISCONNECT



01 - ELECTRICAL POWER PLAN - MOVING WALKWAY 3

SCALE: 1/8" = 1'-0"

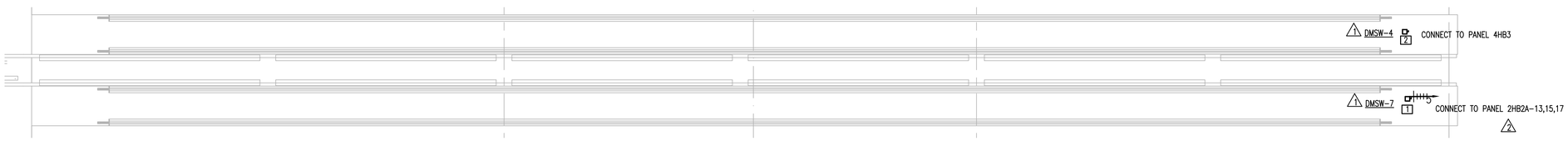


02 - ELECTRICAL POWER PLAN - MOVING WALKWAY 1

SCALE: 1/8" = 1'-0"

03 - ELECTRICAL POWER PLAN - MOVING WALKWAYS

SCALE: 1/8" = 1'-0"



04 - ELECTRICAL POWER PLAN - MOVING WALKWAYS 4 & 7

SCALE: 1/8" = 1'-0"

05 - ELECTRICAL POWER PLAN - MOVING WALKWAY 6

SCALE: 1/8" = 1'-0"

HOUSTON AIRPORTS

IAH TERMINAL D CONVEYANCE REPLACEMENT - 2800 N TERMINAL RD, HOUSTON, TX 77032

IAH TERMINAL D CONVEYANCE REPLACEMENT

C.I.P. No.	A.I.P. No.
C.O.H. No.	D.O.A No.

MWA ARCHITECTS
11767 KATY FREEWAY SUITE 430
HOUSTON, TEXAS 77079 - 713-482-2338

DESIGNER PROJECT No.:	23-08
PROJECT STATUS:	ISSUE FOR CONSTRUCTION
1 ADD. #6	04/09/2024

REVISIONS

No.	DESCRIPTION	DATE	BY
0	ISSUED FOR PERMIT	05/16/2023	
1	PERMIT REVISIONS	05/25/2023	
2	PERMIT REVISIONS	06/06/2023	
3	ADD. #6	04/09/2024	

DESIGNER:	JE
DRAWN BY:	JE
CHECKED BY:	JE
ISSUE DATE:	11/28/2023
APPROVED BY:	
APPROVAL DATE:	

DIRECTOR
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HOUSTON AIRPORT SYSTEM

Review/ Approval Category

IFC

ISSUED FOR CONSTRUCTION

N. CURTIS JONES, JR. 58428 REGISTERED PROFESSIONAL ENGINEER 4942 11/28/2023

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TERMINAL "D"

SHEET NAME:
ELECTRICAL FLOOR PLANS

SHEET No.	SCALE:
E2.02	

JONES ENGINEERS, L.P.
Consulting Mechanical/Electrical/Plumbing Engineers
9820 Whithorn Dr. Houston, Texas 77095 (713)222-7766
Texas Registered Engineering Firm #F-3811

SHEET SIZE: 22"x34" ANSI-D

FILE PATH: Y:\4900'S\4942 - HAS IAH TERMINAL D CONVEYANCES\DWGS\4942 - E101.DWG

OLD DOA No.:
DOA DWG FILE:
PLOT DATE: 16 April 2024 12:08:23 PM

GENERAL PLAN NOTES

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14. PROVIDE GROUND WIRE IN EXISTING CONDUIT FOR ELEVATORS, ESCALATORS, AND MOVING WALKWAYS

PLAN KEYNOTE

[1] NEMA 4X JUNCTION BOX FOR SUMP PUMP, SWITCH AS INDICATED. PROVIDE 1" CONDUIT BACK TO PUMP CONTROL PANEL IN MACHINE ROOM. COORDINATE EXACT LOCATION/TERMINATION/ROUTING IN FIELD.

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[3] EXISTING LIGHT TO REMAIN.

[4] EXISTING LIGHT SWITCH TO REMAIN.

[5] 100A/3P/100A DUAL ELEMENT FUSE. LOCKABLE IN "OFF" POSITION AS PER OSHA STANDARDS. RECONNECT TO EXISTING CIRCUIT SERVING REMOVED ELEVATOR MOTOR. COORDINATE EXACT LOCATION IN FIELD.

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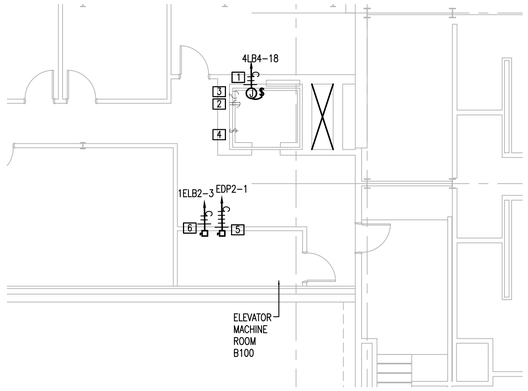
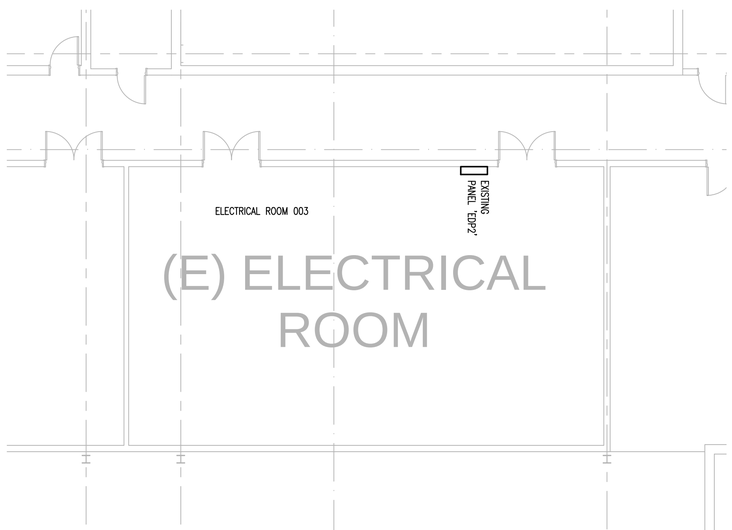
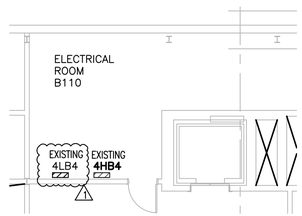


01 - ELECTRICAL POWER PLAN - ELEVATOR 1



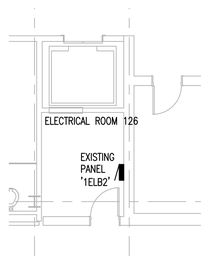
02 - ELECTRICAL POWER PLAN - WEST ELEC RM

SCALE: 1/8" = 1'-0"



03 - ELECTRICAL POWER PLAN - ELEC B110

SCALE: 1/8" = 1'-0"



04 - ELECTRICAL POWER PLAN - ELEC RM

SCALE: 1/8" = 1'-0"

HOUSTON AIRPORTS

IAH TERMINAL D CONVEYANCE REPLACEMENT - 2800 N TERMINAL RD, HOUSTON, TX 77032

IAH TERMINAL D CONVEYANCE REPLACEMENT

C.I.P. No.	A.I.P. No.
C.O.H. No.	D.O.A No.

MWA ARCHITECTS
11767 KATY FREEWAY SUITE 430
HOUSTON, TEXAS 77079 - 713-482-2338

DESIGNER PROJECT No.:	23-08
PROJECT STATUS:	ISSUE FOR CONSTRUCTION

REVISIONS

No.	DESCRIPTION	DATE	BY
1	PERMIT REVISION.	12/07/2023	
2	ADD. #6	04/09/2024	

DESIGNER:	JE
DRAWN BY:	JE
CHECKED BY:	JE
ISSUE DATE:	11/28/2023
APPROVED BY:	
APPROVAL DATE:	

DIRECTOR
of
HOUSTON AIRPORT SYSTEM

Review/ Approval Category
IFC
ISSUED FOR CONSTRUCTION

STATE OF TEXAS
N. CURTIS JONES, JR.
58428
REGISTERED PROFESSIONAL ENGINEER
4942
11/28/2023
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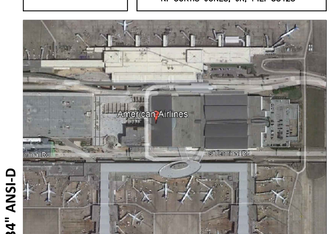

TERMINAL "D"

SHEET NAME:
ELECTRICAL FLOOR PLANS

SHEET No. E2.04

SCALE:

JONES ENGINEERS, L.P.
Consulting Mechanical/Electrical/Plumbing Engineers
9820 Whithorn Dr. Houston, Texas 77095 (713)222-7766
Texas Registered Engineering Firm #F-3811

SHEET SIZE: 22"x34" ANSI-D

FILE PATH: Y:\4900'S\4942 - HAS IAH TERMINAL D CONVEYANCES\DWGS\4942 - E101.DWG

PLOT DATE: 16 April 2024 12:08:42 PM

OLD DOA No.: :
DOA DWG FILE:

GENERAL PLAN NOTES

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PLAN KEYNOTE

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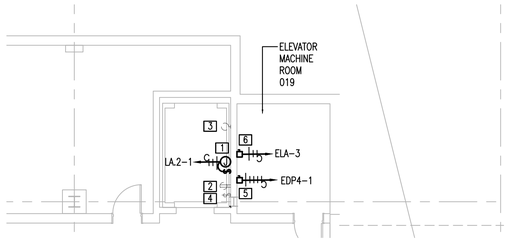
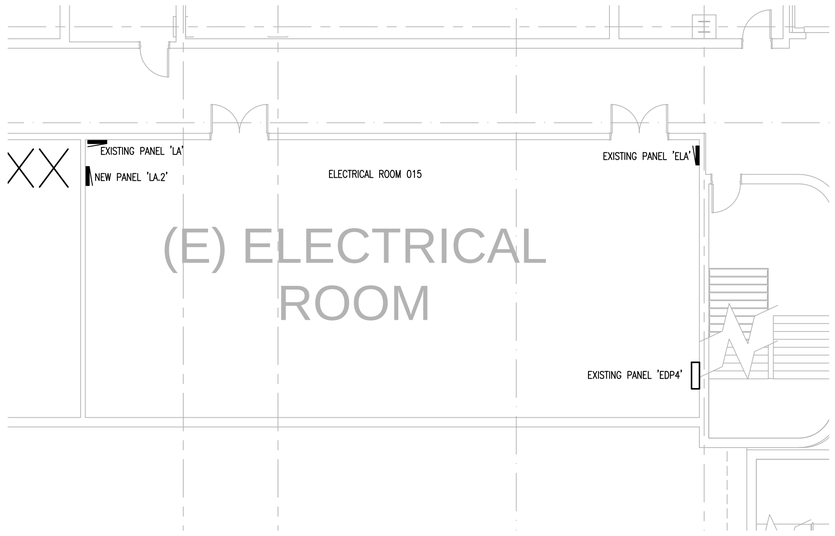
2



01 - ELECTRICAL POWER PLAN - ELEVATOR 7

SCALE: 1/8" = 1'-0"



02 - ELECTRICAL POWER PLAN - EAST ELEC RM

SCALE: 1/8" = 1'-0"

HOUSTON AIRPORTS

IAH TERMINAL D CONVEYANCE REPLACEMENT - 2800 N TERMINAL RD, HOUSTON, TX 77032

IAH TERMINAL D CONVEYANCE REPLACEMENT

C.I.P. No.	A.I.P. No.
C.O.H. No.	D.O.A No.

MWA ARCHITECTS
11767 KATY FREEWAY SUITE 430
HOUSTON, TEXAS 77079 - 713-482-2338

DESIGNER PROJECT No.:	23-08
PROJECT STATUS:	ISSUE FOR CONSTRUCTION

REVISIONS

No.	DESCRIPTION	DATE	BY
1	PERMIT REVISION.	12/07/2023	
2	ADD. #6	04/09/2024	

DESIGNER:	JE
DRAWN BY:	JE
CHECKED BY:	JE
ISSUE DATE:	11/28/2023
APPROVED BY:	
APPROVAL DATE:	

DIRECTOR
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HOUSTON AIRPORT SYSTEM

Review/ Approval Category

IFC

ISSUED FOR CONSTRUCTION

N. CURTIS JONES, JR. 58428 REGISTERED PROFESSIONAL ENGINEER 74942 11/28/2023

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TERMINAL "D"

SHEET NAME:
ELECTRICAL FLOOR PLANS

SHEET No. E2.05

SCALE:

JONES ENGINEERS, L.P.
Consulting Mechanical/Electrical/Plumbing Engineers
9820 Whithorn Dr. Houston, Texas 77095 (713)222-7766
Texas Registered Engineering Firm #F-3811

SHEET SIZE: 22"x34" ANSI-D

FILE PATH: Y:\4900'S\4942 - HAS IAH TERMINAL D CONVEYANCES\DWGS\4942 - E101.DWG

PLOT DATE: 16 April 2024 12:09:02 PM

OLD DOA No. :

DOA DWG FILE:

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PLAN KEYNOTE

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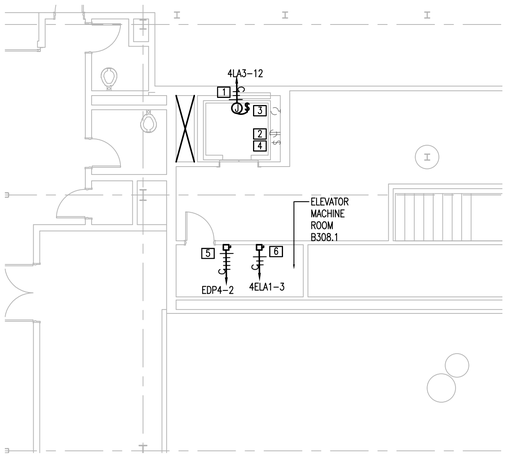
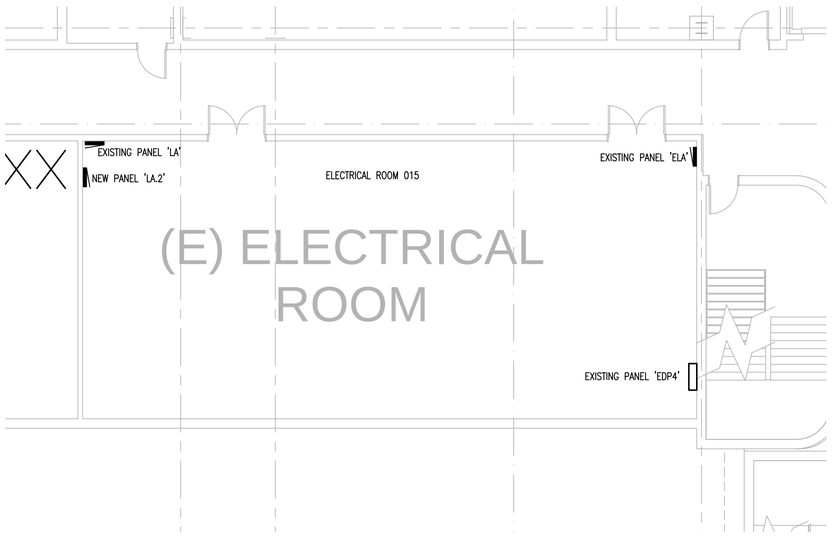


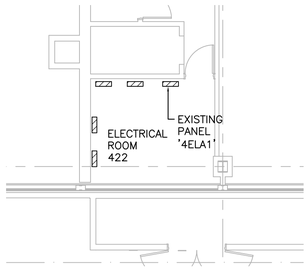
01 - ELECTRICAL POWER PLAN - ELEVATOR 8

SCALE: 1/8" = 1'-0"



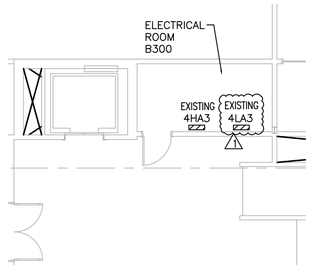
02 - ELECTRICAL POWER PLAN - EAST ELEC RM

SCALE: 1/8" = 1'-0"



03 - ELECTRICAL POWER PLAN - ELEC RM

SCALE: 1/8" = 1'-0"



04 - ELECTRICAL POWER PLAN - ELEC RM

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HOUSTON AIRPORTS

IAH TERMINAL D CONVEYANCE REPLACEMENT - 2800 N TERMINAL RD, HOUSTON, TX 77032

IAH TERMINAL D CONVEYANCE REPLACEMENT

C.I.P. No.	A.I.P. No.
C.O.H. No.	D.O.A No.

MWA ARCHITECTS
11767 KATY FREEWAY SUITE 430
HOUSTON, TEXAS 77079 - 713-482-2338

DESIGNER PROJECT No.:	23-08
PROJECT STATUS:	ISSUE FOR CONSTRUCTION

REVISIONS

No.	DESCRIPTION	DATE	BY
1	PERMIT REVISION.	12/07/2023	
2	ADD. #6	04/09/2024	

DESIGNER:	JE
DRAWN BY:	JE
CHECKED BY:	JE
ISSUE DATE:	11/28/2023
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APPROVAL DATE:	

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Review/ Approval Category

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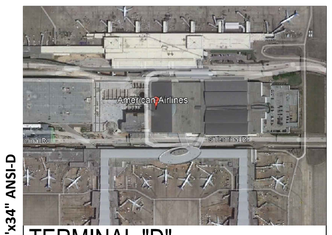

TERMINAL "D"

SHEET NAME: ELECTRICAL FLOOR PLANS

SHEET No. E2.06

SCALE:

JONES ENGINEERS, L.P.
Consulting Mechanical/Electrical/Plumbing Engineers
9820 Whithorn Dr. Houston, Texas 77095 (713)222-7766
Texas Registered Engineering Firm #F-3811

SHEET SIZE: 22"x34" ANSI-D

FILE PATH: Y:\4900'S\4942 - HAS IAH TERMINAL D CONVEYANCES\DWGS\4942 - E101.DWG

PLOT DATE: 16 April 2024 12:09:26 PM

OLD DOA No. :
DOA DWG FILE: