HAS ELECTRICAL STANDARDS

These standards have been developed and adopted by the Houston Airport System to assure superior quality and workmanship resulting in jobs that have long life expectancy, are less vulnerable to damage and are easily maintained. It is not the intention of these standards to make project design and installation unreasonably difficult or costly. If a consultant or tenant has an alternate, code approved, method that they wish to considered, they may contact the IAH Electrical Superintendent, in writing, and request approval on a case by case basis. An exception granted for a specific project shall not constitute a waiver of these standards for future work.

General

A. Tenants, contractors and/or consultants shall comply with all (IAH) Plan Review requirements.
B. Contractors shall comply with the latest City of Houston (COH), Electrical Ordinance, National Electrical Code (NEC) and other applicable codes and standards.
C. Contractors shall secure all required permits prior to the commencement of any electrical work.
D. Contractors shall employ only personnel with a City of Houston electrical license.
E. All Contractors or HAS employees SHALL abide by all OSHA and NFPA safety practices, and accurately maintain records when securing electrical equipment for safety. Records must be kept and on file when performing (LOTO) Lock-Out-Tag-Out procedures.

IAH-PLAN REVIEW REQUIREMENTS

A. Power drawing(s) shall include:

1. One-line diagram of power distribution system
2. One-line diagram of emergency system(s)
3. Panel Schedule(s)
4. Load analysis
5. Power Outlets
   a. Outlet locations
   b. Circuit number and panel designation
   c. Conduit and wire size for each circuit
   d. Each drawing shall include the note: "Type AC (BX) and MC cable is prohibited".

B. **Lighting drawing(s) shall include**:

1. Emergency lighting location and circuiting
2. Exit lighting location and circuiting
3. Fixture schedule
4. Lighting fixture layout
   a. Lighting fixture location and type(s)
   b. Circuit number and panel designation
   c. Switching
   d. Each drawing shall include the note: "Type AC (BX) and MC cable is prohibited".

C**. Fire alarm drawing(s) shall include:**

1. Locations of all detection devices and pull stations.
2. Locations of all audible and visual alarm devices.
3. Locations of annunciator panel(s)
4. Schematic diagram including all existing connections to fire alarm, security and air conditioning system controls.
5. Schematic diagram including all new connections to security and air conditioning system controls

D**. Telecommunications and data line diagrams shall include:**

1. Outlet locations and type and identification
2. Cable schedule
3. Installation method, i.e., raceway types, cable types, etc.
4. IDF/MDF room for homerun connections

F. **UPS Uninterruptable Power Supply Units.**

Eaton /Powerware Products Only

For the purposes maintaining only one Service Agreement and consistency.
That is already established at IAH, Hobby, Ellington AFB as of 4/8/2014 we have 25 Eaton Powerware UPS Units currently being serviced by One Vendor to keep cost at a minimum.
(Communication should be established to all involved parties should this change)

IAH INSTALLATION REQUIREMENTS

A. Upon completion of a project, the contractor shall provide and updated one-line diagram of the distribution system.
   1. For large jobs (more than two panels and one transformer) a copy of the one-line diagram shall be framed, covered with a transparent plastic (plexi-glass) cover and mounted where approved by the IAH engineer of Electrical Superintendent. This location may be a convenient wall or the back of the electrical room door.
   2. For small projects a suitable protected one-line diagram may be mounted on the cover of the distribution panel.

B. Upon completion of a project, the contractor shall provide an updated, typed panel schedule for all circuit breaker panels.

C. L.E.D Lighting Products

There exists a testing and certification body which is the entity also known as the "Digital Lighting Certification" (DLC) which tests the hardware for safety and performance and compliance.

The use of LED's fixtures shall possess the proper certification (DLC) is required when used at any Houston Airport System facility , this will allow for energy savings to be incorporated in the future of Houston Airport Systems.

TEMPORARY WIRING

A. Contractors shall be responsible for, at their own expense, the installation of all temporary electrical utilities

B. Unless otherwise directed by the IAH engineer of the Electrical Superintendent, upon completion of the project, the contractor shall remove all vestiges of temporary construction utilities.

INSTALLATION METHODS

CONDUIT

A. All wiring shall be installed in metallic raceways. **THE USE OF TYPES AC (BX) AND MC CABLES AND ½" EMT CONDUIT ARE PROHIBITED**, except by special written permission of the IAH Electrical Superintendent.
B. Exception: Underground feeders and branch circuits may be installed in Schedule 40 or Schedule 80 PVC conduit. A hazard warning tape must be installed 6" below grade directly above the conduit when the trench is back filled.
   1. The section of vertical conduit from 6" below grade shall be rigid galvanized conduit. A coating of asphalt or PVC will be applied from 6" below grade to 6" above grade.
   2. All underground circuits shall be installed in conduit. **DIRECT BURIAL CABLE IS PROHIBITED**.
   3. All underground conduit will be sized at least one trade size larger than NEC requirements for conduit fill. (Intended for branch circuits ½" thru 1 1/4")
C. In locations where conduits are subject to severe physical damage, such as warehouses, landing docks or baggage handling areas where vehicular traffic is a potential source of damage, conduits shall be rigid galvanized steel to a minimum height of 8' AFF.
D. In locations where conduits are subject to severe physical damage, such as warehouses, loading docks or baggage handling areas where vehicular traffic is a potential source of damage, equipment shall be protected by suitable protection such as bollards or mechanical guards.
E. Grounding electrode conductors shall be armored or installed in conduit and shall be terminated in approved fittings.
F. Flexible metal conduit, also known as Greenfield, shall be permitted for "Fixture whips" and the wiring of fractional horsepower motors only. ½" minimum size except for individual fixture whips
G. Liquid tight flexible metal conduit shall be used for transformer or motor connections, or where flexibility is required
H. Where an equipment grounding conductor is required by the NEC to supplement the grounding capacity of flexible conduit, it shall be installed outside the conduit.

BOXES

A. Pull boxes, hand holes or fittings
   1. Shall be spaced a maximum of 450' apart for outdoor feeder installations
   2. Shall be spaced a maximum of 90' apart for indoor/outdoor branch circuits
   3. Shall be spaced a maximum of 150' apart for indoor feeders
   4. The above spacing does not preclude the NEC limiting the maximum number of bends in a conduit run.
   5. All boxes (except in-ground) shall be supported independently of the conduit and to the structure of the building.
B. Device boxes
   1. Shall be a minimum of 4"x 4"x1 ½" and use a device ring
   2. All boxes shall be supported independently of the conduit and to the structure of the building.

CONDUCTORS

A. Minimum wire size for branch circuits shall be No. 12 AWG copper
   1. 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

2. 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 used for branch circuits providing:
   1. They are connected to wiring devices that utilize clamp type terminations rather than binder head screw connections.
   2. They are terminated with spade type lugs for binder head screw connections
   3. 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. Conductor color coding shall be consistent along the entire length of a circuit. Color coding shall be as follows:

G.	**120/208**	**A phase- Black** **B phase- Red** **C phase- Blue** **Neutral- White**	**277/480**	**A phase- Brown** **B phase- purple** **C phase- Yellow** **Neutral- Gray**

WIRING DEVICES

A. All flush wall plates for wiring devices, or with bushed openings for cables shall be stainless steel

B. Wall plates with bushed openings shall be installed at each location where a data or telecommunications cable enters or exits a wall, passing cable through rough, unfinished openings is prohibited.

C. Wall plates designed for flush mounting shall not be used on surface mounted junction, device or switch boxes.

D. Standard wiring devices may be ivory, brown, or other suitable color.
   1. Red wiring devices shall only be used in circuits that have emergency use
   2. Orange wiring devices shall only be used in circuits that have isolated grounding conductors

E. Wiring devices that depend on “stab-in” or “speed wiring” terminals shall be prohibited

LIGHTING FIXTURES

A. Use of pull chain operated light fixtures shall be prohibited

B. All ballast operated lighting fixtures shall be equipped with individual in-line fuses located in the fixture, remote ballast package or the pole base. This is to prevent a shorted ballast from tripping the branch circuit breaker.

POWER DISTRIBUTION

A. Panels
   1. Panel boards
      a. All breaker assemblies with a 100 amp and larger main breaker or feeder will utilize bolt-on main and branch breakers
      b. All breaker assemblies with a 100 amp and larger main breaker or feeder will have copper-clad bussing

   c. All breaker assemblies with a 100 amp and larger main breaker or feeder and designed to accommodate more than 18 single poles will have a "door in door" type cover
   d. Unless clearly evident, load centers will be labeled as to feeder location (distribution center name and circuit number)

B. Transformers
   1. All distribution transformers will have a 120/208 volt, three phase secondary
   2. Unless clearly evident, transformers will be labeled as to feeder location (distribution center name and circuit number)
   3. All distribution transformers will be set on isolation pads

C. Disconnects Switches
   1. Disconnect switches shall be mounted to building framing members. Mounting methods dependent on sheetrock walls is prohibited.
   2. Unless clearly evident, disconnect switches will be labeled as to feeder location (distribution center name and circuit number)

D. Starters
   1. Starters shall be mounted to building framing members. Mounting methods dependent on a sheetrock wall is prohibited.
   2. All starters will be labeled as to the motor controlled and the feeder location (distribution center name and circuit number)
   3. All starters will utilize a 120 volt or less control circuit. 480 volt controls are prohibited.

E. Tenant Meters
   1. Meters shall be mounted to building framing members. Mounting methods dependent on sheetrock wall is prohibited.
   2. All meters will be labeled with the lease space name

F. Office Space Wiring
   1. Extension cords , refrigerators, microwaves, fish tanks, electrical portable space heaters , foot massagers ect… are not allowed in IAH office spaces and cubicles unless approved by management, and the electrical wiring is designed to support the additional load for that special piece of equipment or appliance,. Failing to comply with rule will cause nuisance tripping of circuit breakers due to overloads that could affect other office spaces and personnel, and shorten the life of the electrical infrastructure.

LOW VOLTAGE SYSTEMS

A. Fire Alarm

1. All final connections to and programming of existing Fire Alarm Control Panel(s) will be by a notifies authorized contractor (approved by HAS Electrical/Systems), at the contractors expense
2. All devices shall be compatible with the existing system(s)
3. All wiring shall be in conduit
   a. All junction boxes shall be painted red
   b. All junction box covers shall have circuit numbers printed on them
   c. Shall follow all general requirements as listed, above, in the CONDUIT Section
4. All connections to existing circuits shall be coordinated through IAH Systems personnel with at least 24 hours notice
5. All testing requires a 48 hour notification through IAH plan review/construction coordination to Systems personnel

6. All access to Fire Alarm Control Panel rooms requires a 24 hours notices to Systems personnel.

B. Card Access System

1. All devices shall be compatible with the existing system(s)
2. All devices shall be used for compliance with FAA regulations only
3. Wiring in cable tray is permitted
4. Wiring on J-Hooks is permitted
   a. Maximum distance between J-Hooks shall be 8'
   b. One hook to be installed directly over the wall outlet and one directly over cable tray. The cable will be secured at these two hooks (only)
   c. Minimum conduit from outlet box to ceiling cavity shall be 1" and terminated with a threaded bushing (and connector for EMT)
   d. Joints in the wiring shall be allowed in boxes only. No joints allowed in the ceiling, walls or cable tray.
   e. All outlets require a minimum 4"x4"x1 ½" outlet box with plaster ring
5. All connections to existing circuits or head-in equipment requires at least 24 hour notice to IAH Systems personnel
6. All access to IDF/MDF rooms requires 24 hour notice to Systems personnel

C. CCTV System

1. All devices shall be compatible with the existing system(s)
2. All devices shall be used for compliance with FAA regulations only
3. Wiring on cable tray is permitted
4. Wiring on J-Hooks is permitted
   a. Maximum distance between J-Hooks shall be 8'
   b. One hook to be installed directly over the wall outlet and one directly over cable tray. The cable will be secured at these two hooks (only)
   c. Minimum conduit from outlet box to ceiling cavity shall be 1" and terminated with a threaded bushing (and connector for EMT)
   d. Joints in the wiring shall be allowed in boxes only. No joints allowed in the ceiling, walls or cable tray.
   e. All outlets require a minimum 4"x4"x1 ½" outlet box with plaster ring
5. All connections to existing circuits or head-in equipment requires at least 24 hour notice to IAH Systems personnel
6. All access to IDF/MDF rooms requires 24 hour notice to Systems personnel

D. PUBLIC ADDRESS SYSTEM

1. All 70 volt wiring shall be installed in conduit as per the City of Houston Electrical Code and the National Electrical Code
2. All connections to existing circuits or head-in equipment requires at least 24 hour notice to IAH Systems personnel
3. All access to IDF/MDF rooms requires 24 hour notice to Systems personnel

DEMOLITION

REMOVAL

A. Remove all abandoned feeder and branch circuit conduits and wiring. Exceptions- Where there are exists a strong possibility (as per the Electrical Superintendent) that a conduit or circuit may be of future value, it may be left in-tact, providing the panel is labeled as such, and the installation meets the standards of the latest NEC.

B. Remove all abandoned data, telephone, sound, CCTV, MATV and card access wiring

PROTECTION OF UTILITIES

A. Prior to digging at any IAH facility, contractors shall be responsible for contacting the Utility Coordinating Committee and the PDC inspector monitoring the project, to have the underground utilities located and flagged. The PDC inspector shall request the services of the Airport maintenance sections, through job control, to locate and identify and IAH owned utilities. These requests shall be made at least 48 hours prior to digging.

B. It shall be the Contractor's responsibility to take any and all precautions necessary to avoid doing damage to any utilities. If a Contractor damages an identified utility, or does damage because of his failure to have the utility located, it shall be the Contractor's responsibility to make appropriate repairs at his own expense. Any repairs that have to be made by IAH personnel shall be charged back to the Contractor. These charges shall include penalties adequate to discourage indifference to the sensitivity of utilities at the airport.

Work Area Notifications WAN

WAN shall be used in all instances when performing work in HAS electrical rooms.

And include the following;

- Date WAN was issued - (see next page for example)
- Include all Contractor Names performing the work and contact numbers.
- Include All Involved Parties overseeing the work and contact numbers
- Include Primary Contact Name and Number of responsible person in charge of work.
- Include E-Mail addresses of all Electrical Systems Division Manager and Superintendents.

Division Manager – Bruce Hays bruce.hays@houstontx.gov
Superintendent - Dewayne Jernigan dewayne.jernigan@houstontx.gov
Superintendent - Stephen Beaulieu stephen.beaulieu@houstontx.gov

Here are the Steps in filling out the Work Area Notifications with Contractors

1. Project is awarded to contractor and start day is tentatively established.
2. Work Area Notification is completely filled out and delivered to Operations.

To the below E-Mail Addresses;

albert.ausberry@houstontx.gov
robert.hatchley@houstontx.gov
steven.weems@houstontx.gov
bobby.miller@houstontx.gov
dana.growden@houstontx.gov
steven.roque@houstontx.gov

3. Contractor should establish a PRE-WAN Meeting and invite all involved parties and departments and companies/persons impacted by the WAN. This is done to discuss scope of work and to discuss equipment or areas impacted by the work.
4. A sign in sheet must be brought to the meeting used by the person or company in charge of the work going to be performed and acknowledged by everyone.
5. Any Concerns or issues with the proposed WAN should be brought up and answered.
6. Once the Pre-WAN meeting is completed Operations will contact all Sections and parties involved. by E-Mail and discuss any issues regarding the WAN , such as Time, Location & Impacts.
7. After step 6 is approved and completed, Operations will send out an approved WAN to all Involved parties impacted by this WAN informing them of when the work will start.
8. **The pre WAN meetings should only be required if the proposed work is expected to cause a disruption to utilities and be called on a case by case basis.**

Contractors Performing Work or needing access in electrical rooms that is within IAH Infrastructure

- No One is allowed in a secured energized electrical room within the IAH Infrastructure without permission of IAH Electrical Personnel.
- Only Licensed Electrical contractors by the State of Texas and City of Houston Are allowed in HAS/IAH electrical rooms performing work or with special permission or escorted by HAS/IAH employee with escorting privileges.

Electrical Room Access and permissions contact numbers;

281 230 8790	281 230 8797	281 230 8793
281 230 8771	Dispatch 281 230 3024	