

Project: Timpanogos Regional Hospital – MRI Retrofit

Addendum #2

Date: August 28, 2020

To: Contractors/Subcontractors

From: HKS Architects, Inc
90 South 400 West, Suite 110
Salt Lake City, Utah 84101
(801) 532-2393

The Pricing Documents shall be amended and/or revised by Addendum hereinafter specified and all Work affected by this Addendum shall be included.

Except as may otherwise be described, labor and materials for the Work hereinafter shall conform to all requirements of the original Contract Documents.

Pages of Addendum: 51 each pages or sheets

General Clarifications:

- Clarification: Builders Risk insurance shall be provided by the Owner. It shall NOT be included in the bid amount.
- Clarification: Owner will pay for the building permit. Do NOT include any permit costs in the bid amount.
- Clarification: Site work prep for the temporary MRI trailer shall be done separately by the facility, other than the temporary walkway enclosure.
- Clarification: There is no information available for the RF or magnetic shielding that is currently installed, to know the existing construction / configuration.

General Clarifications (continued):

Clarification: The time frame for the construction of the project is to be determined by the time submitted on the bid. Currently it is planned for the temporary MRI to be delivered on 9/30 and start operations on 10/5. GE is planning to have their equipment de-install starting October 5th, with their completion scheduled to be finished on October 15th. Contractor demolition work on the rest of the MRI suite can begin after this.

Note:

The contractor shall remove the corridor access wall, and associated ceiling, including associated RF and magnetic shielding, for the removal of the magnet, which GE starts October 5th. This work shall be coordinated with GE representatives.

Clarification: There is no current specific ICRA statement compiled for this project. Use the following parameters:
Barriers that will be in place for more than 48 hours shall be constructed of fire treated plywood or gypsum board (fire taped) on the corridor side. Barriers shall seal to the ceiling system and floor. Plywood or gypsum board shall seal against floor and ceiling (appropriate tape). Doors shall be swing type with latch / lock and seals. Door keys shall be provided to the facility.
Barriers that will be in place for less than 48" hours may be constructed out of fire retardant, reinforced, poly material, held in place against floor and ceiling with compression poles. Poly material shall seal against floor and ceiling (appropriate tape). Doors shall be zip type.
Barriers shall be constructed to allow 6'-0" wide circulation thru the corridors, unless otherwise cleared with the facility. This information does not preclude the facility from requiring additional measures as they see fit.

Clarification: Vibration study required as part of GE information shall be done under a separately issued PO from this project. That cost shall NOT be included in the bid amount.

Specification Clarifications:

Specification Section 00 3100 Available Project Information:

Clarification: Information concerning Ferrogard is attached for reference.

Clarification: Information concerning purchase order for PDC RF Shielding is attached for reference.

Specification Section 01 2100 Allowances:

Add: Add an allowance of \$1,000 per new door for door hardware (a total of \$5,000), in lieu of providing the door hardware as noted in the hardware groups. Hardware specifics will be worked out after bidding.

Specification Section 08 1416 Prefinished Flush Wood Doors:

Clarification: No additional information is available as to the manufacturer of the existing wood doors indicated in the specification to match in 2.1.A. Doors of various manufacturers are acceptable, as long as the finish noted, WD-01 (plastic laminate finish indicated on sheet A2.02) is achieved.

Specification Section 13 4923 RF_MRI Modular Shielding

Clarification: This section is included as a basis for the Contractor's work requirements in relation to the separate PO being issued by the Owner for the RF Shielding. Refer to specification 00 3100 Available Project Information, attached, for PDC requirements for Contractor work.

Architectural Clarifications:

Sheet AD.01 Demolition Plan

Clarification: The depth of the existing access flooring indicated in the keyed note 'AFD' is noted in concrete restoration note 2, as being an existing 12" deep recess, which is the same recess depth as is documented in picture 02 'Existing Floor Slab Plan on the same sheet.

Sheet A2.01

Door Information:

Clarification: The facility has confirmed that the existing door hardware is Yale. Their current supplier is Robert I Merrill.

Architectural Clarifications (continued):

Sheet A2.02:

Finish Plan 02:

Clarification: There is no product information available for the solid surface countertops indicated in the finish information as SS-01: That is why the picture was provided (picture 03) to provide as much information as possible for bidding a product that could match the existing material.

Clarification: Sheet vinyl (SHV-01) is indicated in MRI 1008 on the finish plan. See information below concerning sheet vinyl material

Clarification: Finish note 5 shall be added:
5. Paint all new and remodeled / patched walls IPT-01, unless directed otherwise by the facility.

Finish Information:

Clarification: Intent of specification section 09 6500 note in 2.1.B was to have the subcontractors contact the supplier noted to find out the existing flooring materials (VCT, LVT and sheet vinyl) in the facility.
Sheet vinyl information was not noted in the finish materials list for this reason. If information on the existing flooring materials is not available, provide a bid for sheet vinyl based upon Mannington Biospec SR as the product. Specific color will be chosen from manufacturer's standard colors.
VCT manufacturer information, if not available, shall be based upon Armstrong commercial grade VCT flooring with similar look / appearance as that indicated in picture 06.
LVT manufacturer information, if not available, shall be based upon Shaw Contract, Uncommon Ground collection flooring with similar look / appearance as that indicated in picture 07.

Site Plan 9:

Clarification: Dimensions for the chiller pad are indicated on the site plan are 14'-0" x 5'-10". These dimensions are larger than the chiller information provided by GE at 11'-3" x 4'-6".

Clarification: The soils underneath the chiller pad shall be undisturbed, or if disturbed during excavation, compacted to 95%.

Architectural Clarifications (continued):

Sheet A2.03:

Add: A temporary walk plan and temporary walk section has been added to this sheet. The cost of this enclosure, including its removal and disposal after final construction, shall be included in the bid.

Sheet A3.39 MRI Shielding Section / Details

Clarification: Section 1 notes about metal stud framing inside of the MRI room enclosure is correct. There are no aluminum framing members.

Delete: Detail 6 on this sheet shall be deleted. It is not required for the GE MRI being installed.

Clarification: All plywood indicated in section 01, and used for backing of the RF shielding at the walls and ceiling, shall be fire treated plywood.

Mechanical Clarifications:

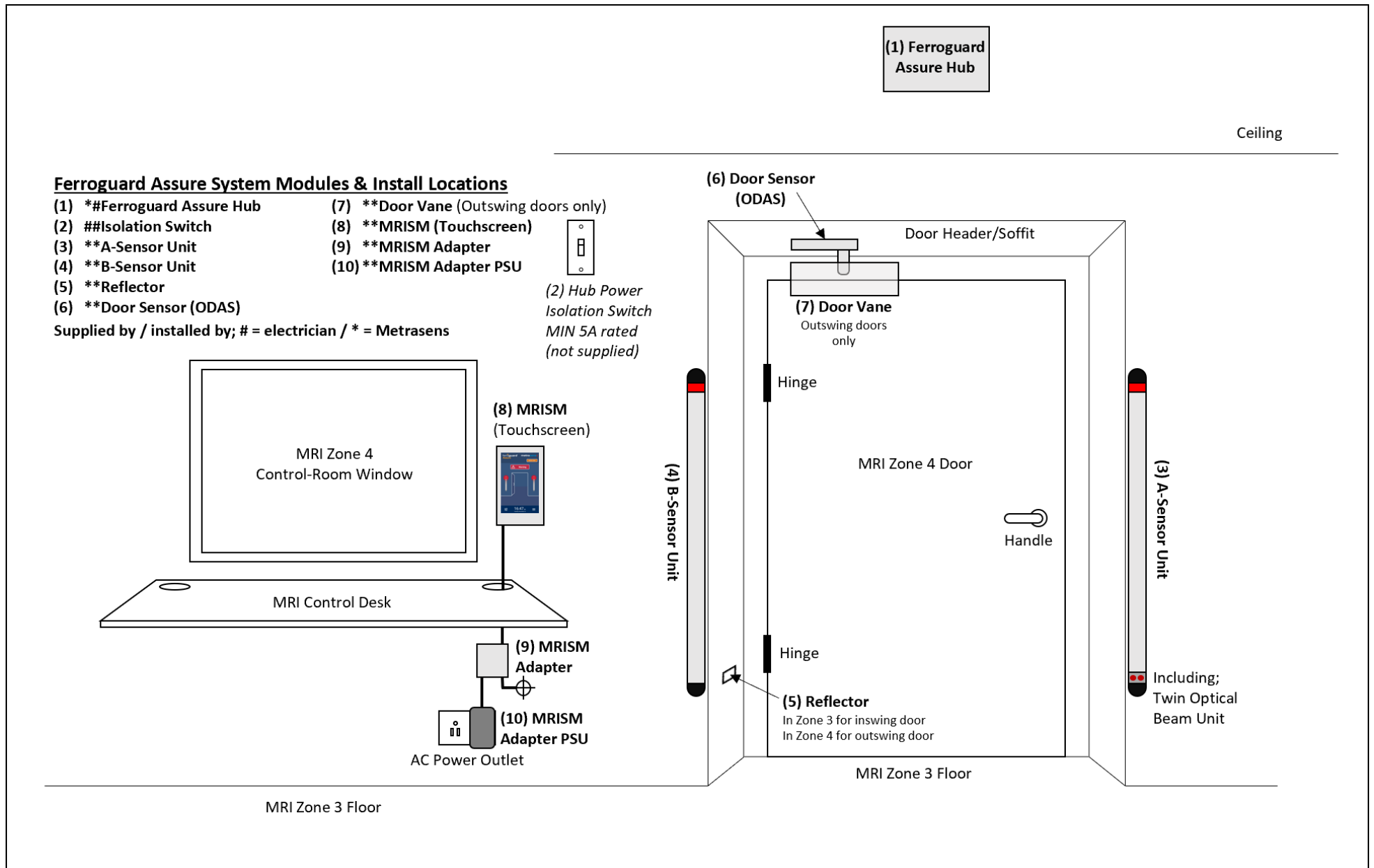
Clarification: Johnson Controls is the current controls vendor for the facility

Clarification: The current MRI equipment room condensing unit is on the roof. Refer to mechanical demolition floor plan for notes.

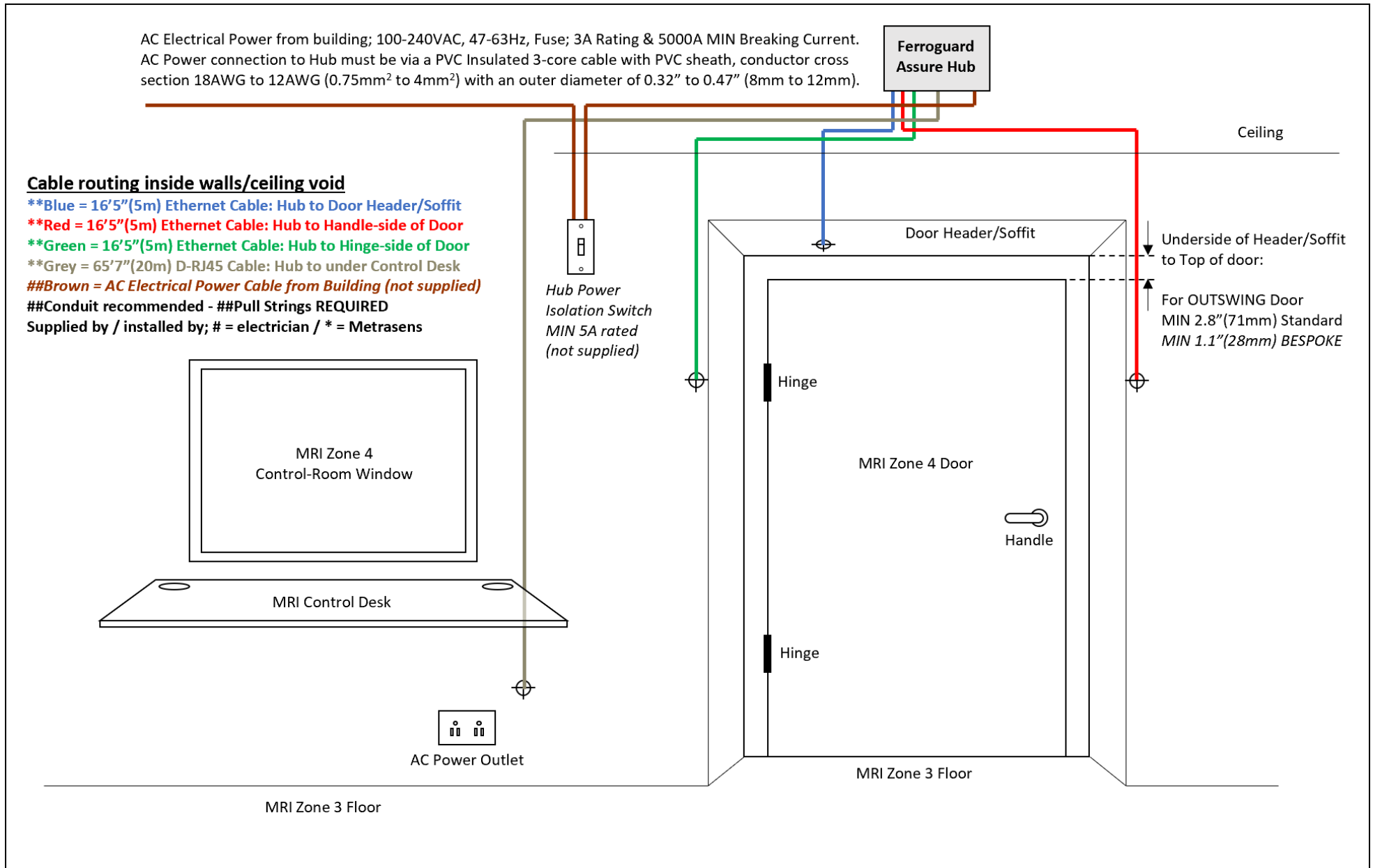
Electrical Clarifications:

Clarification: Refer to the attached information from the electrical engineer in answer to questions that have been asked

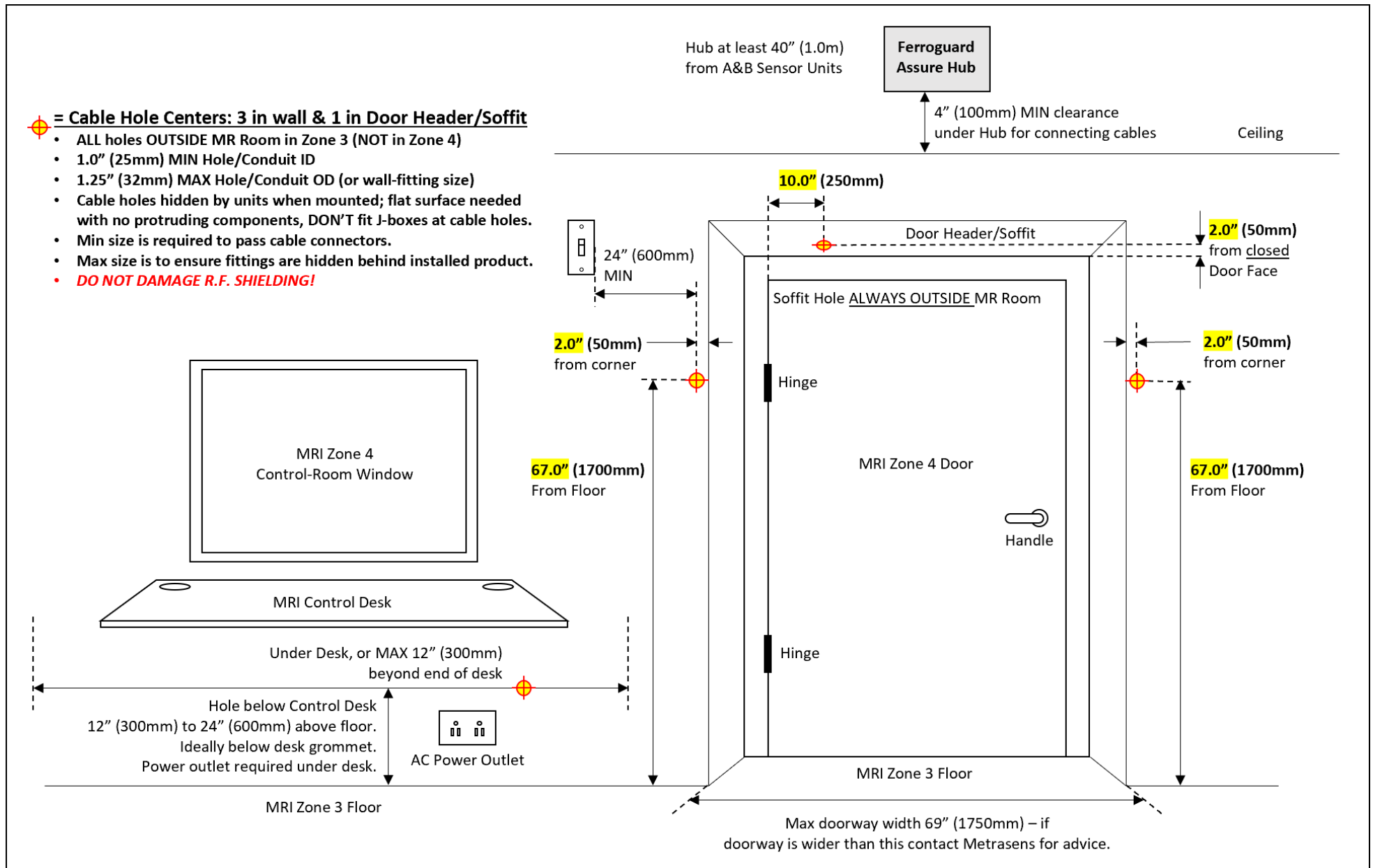
End of Addendum



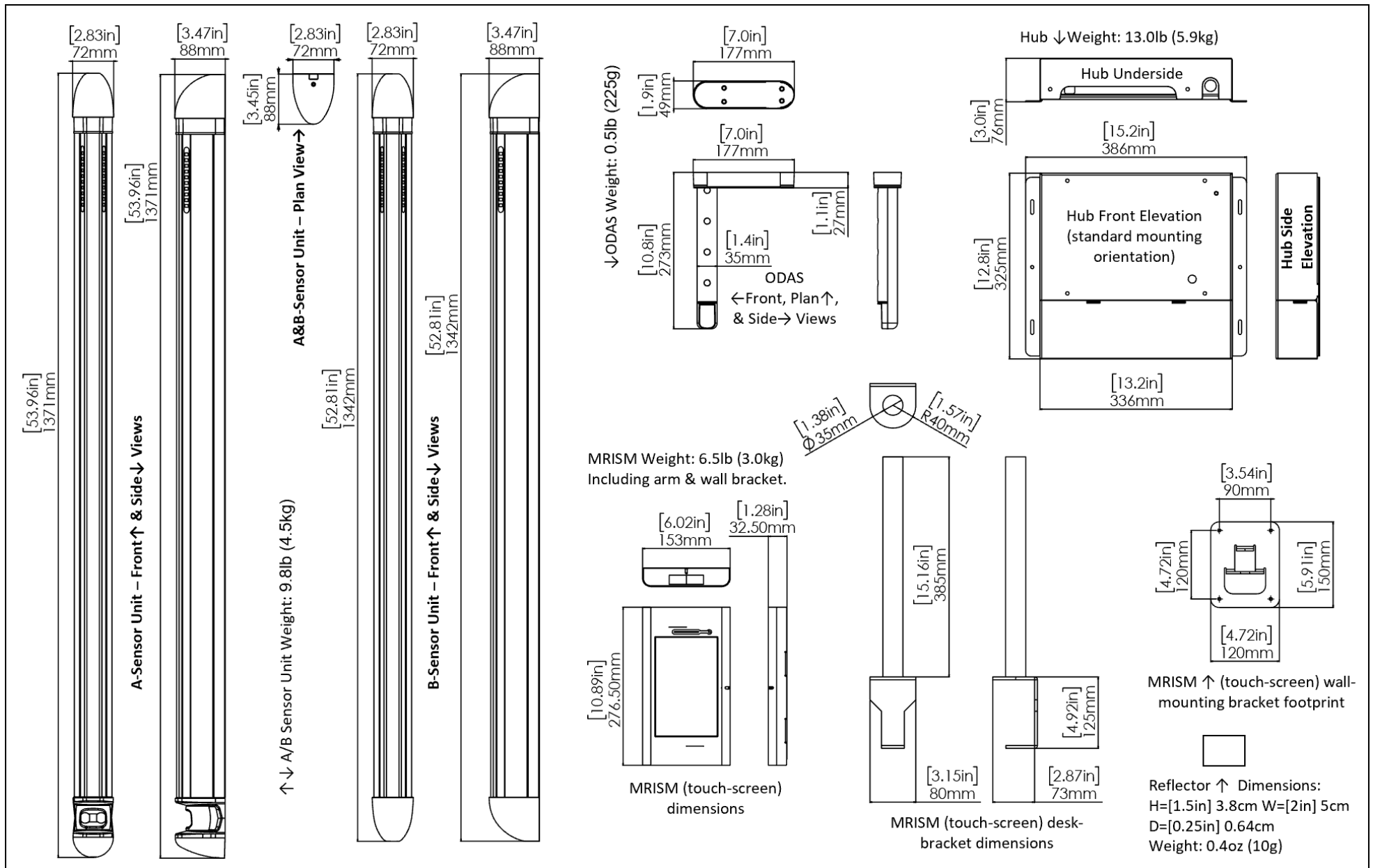
Ferroguard Assure 1.1 Installation Checklist & Cut Sheet (Right Handle)



Ferroguard Assure 1.1 Installation Checklist & Cut Sheet (Right Handle)



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Ferroguard Assure 1.1 Installation Checklist & Cut Sheet (Right Handle)



Pre-Installation Actions & Requirements - to be completed by MR Facility electricians, before arrival of Metrasens Field Service Engineer:

- 1) MRI magnet ramped 100% _____
- 2) Site access arranged (badges, keys, host etc.) _____
- 3) Contact name & number for MRI room access _____
- 4) Site contact for the installation process (*if different then MRI contact*) _____
- 5) Contact for training provided (*if different then MRI contact*). Staff ready and available for training either on the day of installation or day after _____
- 6) Electrician name & contact cellphone number provided _____
- 7) Stepladder made available for Metrasens Engineer to access Hub in ceiling during Final Installation _____
- 8) Hub:
 - a) Hub installed above ceiling (or alternative location agreed with Metrasens) _____
 - b) AC power isolation switch installed in location agreed with Metrasens _____
 - c) AC power connected to Hub via Isolation Switch _____
 - d) AC power confirmed as working - green light on Hub must light up when Isolation Switch is ON _____ **Photograph provided & labeled**
- 9) Magnetic Sensor Units (a.k.a. 'poles'):
 - a) 2x cable holes drilled to left & right sides of MR doorway - *flush, no J-boxes* _____
 - b) *Pull strings from left & right pole cable holes installed through to Hub (via conduit if required) _____ **Photograph provided & labeled**
 - c) Obstructions removed to allow poles to mount on wall (e.g. signs, switches, guard rails) _____ **Photograph provided & labeled**
- 10) ODAS Door Sensor:
 - a) 1x cable hole drilled - *at Hinge side of door, NOT handle side, flush, no J-boxes* _____
 - b) *Pull string installed through to Hub (via conduit if required) _____ **Photograph provided & labeled**
- 11) MRISM Touch-Screen:
 - a) 1x cable hole drilled under control desk - *flush, no J-boxes* (or alternative location agreed with Metrasens) _____
 - b) *Pull string installed through to Hub (via conduit if required) Unless cables are routed via surface-mounted _____ **Photograph provided & labeled**
 - c) Desk grommet present below touch screen mounting position _____ **Photograph provided & labeled**
- 12) Please be sure there is at least 4" of clearance on both the left and right side of the MRI door near the corner edges of the door frame. _____
- 13) Ferroguard units are onsite and unopened _____

Final Installation Actions – to be completed by Metrasens Field Service Engineer:

- | | | | |
|---|--------------------------|-------------------------|--------------------------|
| 14) Install; Magnetic Sensors, ODAS Door sensor, MRISM Touch Screen | <input type="checkbox"/> | 17) Train user | <input type="checkbox"/> |
| 15) Pull low-voltage cables & connect | <input type="checkbox"/> | 18) Installation Date | <input type="checkbox"/> |
| 16) Calibrate system | <input type="checkbox"/> | 19) Miscellaneous Items | <input type="checkbox"/> |

Ferroguard Assure 1.1 Installation Checklist & Cut Sheet (Right Handle)



MRI Contact

Name _____

Cell _____

Electrician

Name _____

Cell _____

Site contact for the installation process (if different then MRI contact)

Name _____

Cell _____

Security

Name _____

Cell _____

Training Contact

Name _____

Cell _____

Other Contact

Name _____

Cell _____

ferr^oguard[®] Assure

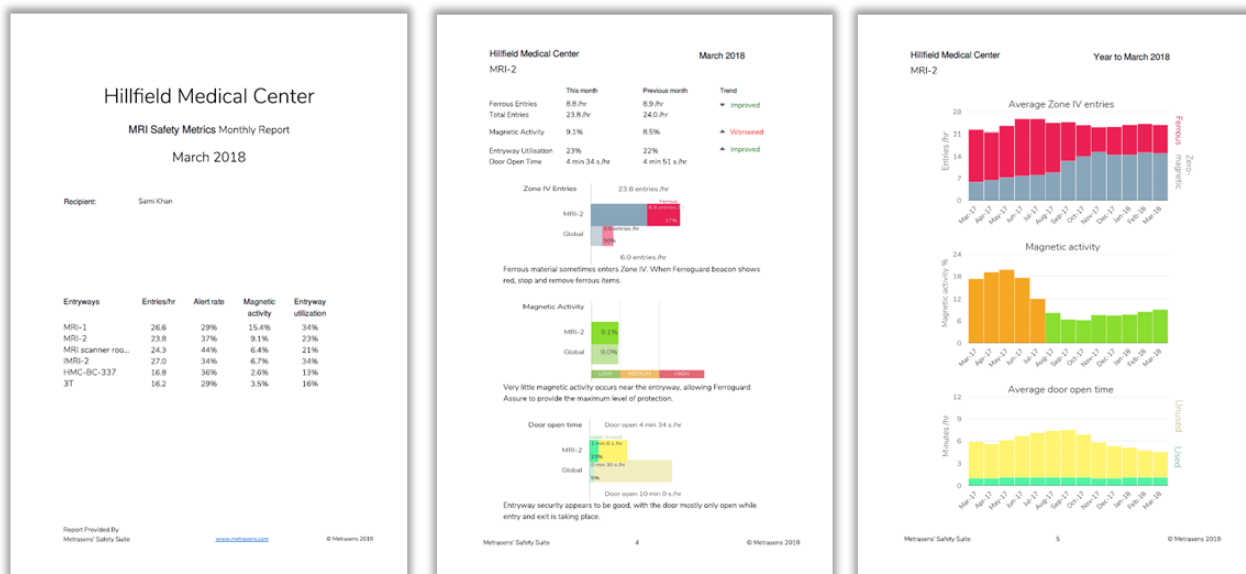
Metrasens' Safety Suite

An overview for IT staff

Metrasens' Safety Suite

Thank you for selecting Metrasens Ferroguard Assure and Safety Suite to enhance safety in your MRI facility.

Metrasens Safety Suite enables MRI managers, Safety Officers and staff to monitor, maintain and improve patient and staff safety in the MRI environment. The system provides authorized staff with remote access to safety data reporting and trend analysis on all Zone-III / IV entries, for all connected scanners in the facility.



Safety Suite captures and reports on the operational safety performance of each entryway, including:

- Number of Zone IV entries per hour** - A measure of how busy that magnet is
- % of entries which triggered alarm** - A lower alarm rate is a measure of safe entries
- % time Zone 4 door open, & utilization** - Ideally, door is only open when staff go in or out
- % time with local magnetic activity** - Measure of ferrous activity in the entryway area

In each case, Safety Suite reports on current performance and provides monthly trend data for each magnet, along with a comparison against benchmarks derived from all other globally connected facilities.

Key data is also summarized and sent as a monthly email to all registered administrators (see example PDF report above), with online analysis available any time. Entryway data can also be selected, extracted and downloaded, for local analysis via Excel.

This document provides a summary for IT staff, on what data is collected and stored, and the specific steps we have taken to ensure this connection is fully compatible with the highest standards of data management.

Types of data gathered and transmitted by Metrasens Safety Suite

Anonymous Statistical Usage Data

Every hour, MRI-Safety-Manager™ collects aggregated data relating to Zone IV entries, including ferrous alerts and doorway usage. **NONE** of the data collected contains any reference to patients, staff, or other individual, which could be used to identify them.

No HIPAA Data

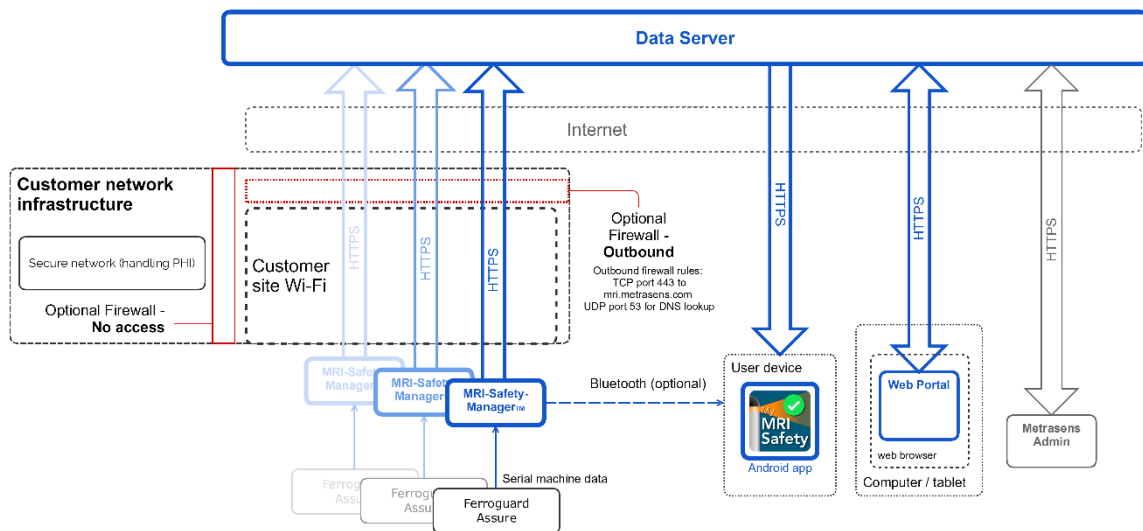
No Individually Identifiable Health Information (IIHI) or other Protected Health Information (PHI) is collected, transmitted, or accessed by Metrasens MRI Safety Suite.

Secure access

Administrator functions of the MRI-Safety-Manager™ – including device settings and data reporting – are protected by a passcode chosen by the Safety Officer or administrator.

MRI Safety Suite : system schematic

The MRI Safety Suite and enabling infrastructure is shown in the diagram below (MRI Safety Suite is in blue).



Metrasens Safety Suite in blue

Safety Suite modules, connections and security features

MRI Safety Manager™ in the scanner control room

- Application running on an Android touch-screen tablet in the MRI control room
- Displays live entryway status from the Zone-IV entrance to a control room display
- Collects Zone-IV anonymous operational statistics
- System syncs anonymous data to the **Data Server** via a permanent WiFi connection
- The WiFi data transfer rate is very low, typically just a few bytes sent every hour

Security features of MRI Safety Manager

MRI-Safety-Manager™ is physically fixed within the MRI control room. The software application it runs is locked down so that

- Users cannot install other apps;
- Users cannot use the USB connection for anything other than connecting MRISM to the Assure hub;
- The MRISM cannot be booted in safe mode, meaning it cannot be factory reset, or "rooted";
- Debugging feature is disabled

Information stored in MRI-Safety-Manager™ is kept in the application's private database and can only be accessed via MRI-Safety-Manager™ itself, using the Safety Officer's pass-code. The pass-code is also required to access device settings, Bluetooth export and System Test information.

All transfer of data and registration information from MRI-Safety-Manager™ to the Data Server uses token-based POST requests from MRISM to server, secured using SSL (HTTPS).

User invitations to the facility use Token based POST requests from MRISM to the Data Server, secured using SSL (HTTPS). The Data Server then distributes time-limited e-mail invitations.

Data Server

- Anonymous operational data stored on AWS server, managed by Metrasens
- Stores synced data from all the facility's Zone-IV entrances
- Serves operational and trend data to facility staff via the **My MRI Safety** app or the web portal

Web Portal and My MRI Safety app

- Enables analysis of Zone IV safety performance and trends by Facility staff

Security features of My MRI Safety App

- My MRI Safety app can only be used by those invited to join a facility by the facility's Safety Officer. From within the app the user must log into their facility, using a password.
- The app includes a database which is synced with the server database whenever the user device is connected to the internet.
- Data transfer between Data Server and the My MRI Safety app is via token-based POST requests from the app, secured using SSL (HTTPS).
- Data is stored in the My MRI Safety app's private database and can only be accessed via the app while the user is logged in.

Security features of Web portal

- Data transfer between Data Server and the browser is secured using SSL (HTTPS)
- Access via the web portal is Account and Password protected

Customer Information Technology (IT) infrastructure preparation

Customer Wi-Fi

MRI-Safety-Manager™ requires a **permanent** connection to the internet via Wi-Fi. (The data transfer rate is very low: a few bytes per hour.)

The following wireless security protocols are supported: WEP, WPA/WPA2-Personal, 802.1x EAP, PEAP with CA Certificate, TLS with CA Certificate, TTLS with CA Certificate

Customer network firewalls (optional)

MRI-Safety-Manager™ can be isolated from other hospital networks by a no-access firewall.

MRI-Safety-Manager™ can be isolated from the internet by an "outbound only" firewall.

Rules: TCP port 443 to mri.metrasens.com (firewall can be restricted by destination IP address, this is currently 18.220.164.245 and 18.219.85.65 but may change in the future).

UDP port 53 for DNS lookup of mri.metrasens.com.

Contact details

www.metrasens.com



For any technical, service or support enquiries, please email us at: support@metrasens.com



For Metrasens' Safety Suite or IT enquiries, please email us at: safety.suite@metrasens.com



For any sales enquiries, please email us at: sales@metrasens.com

North America

Metrasens Inc
Lisle Business Center
2150 Western Court,
Suite 360
Lisle, IL 60532
USA
1 630-541-6509

International

Metrasens Ltd
8 Beauchamp Business Centre
Malvern,
Worcestershire,
WR14 1GL
UK
+44 (0) 1684 219000

PROJECT DETAILS:

To: HCA Healthcare
 Amy Dalton
 801.714.6526
 amy.dalton@mountainstarhealth.com

Project: Timpanagos Regional Hospital
 Orem, UT
 New RF Shield,

Budget 1646

Magnet Vendor: GE; Artist

DESCRIPTION:

Provide and install one PDC Radio-Frequency Shielded Enclosure using PDC's Nickel-Copper Non-Woven RF-Shielding Fabric.

Approximate Room Dimensions: 27' x 16' x 12' (Per Room)

Magnetic Shielding: Not included

Scope of Budget:

The scope of this Budget will include:

- Installation of the RF-Shielded Enclosure, including labor and materials
- Freight costs for all materials covered by the scope of this Budget
- All travel and lodging costs for the PDC installation team
- One (1) return trip to the site to accommodate the delivery of the magnet
- One (1) PDC RF Integrity Test following IEEE 299 Modified for MRI (replaces MIL STD 285)
- Five-Year Limited Warranty on the RF Enclosure (see "Terms of Warranty" later in this document)

This Budget includes the following RF-shielding components:

Components included:

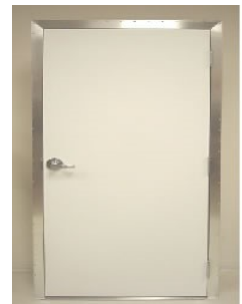
RF Door: (Per Room)

One (1) RF-Shielded Door, approximately 85" x 51" x 2", featuring an aluminum core and unfinished-wood or plastic-laminate panel veneer, with new Fabric-Over-Foam Gasket Material providing the RF Shield. Frame is extruded aluminum profile with a polished finish.

Options Selected:

1. STC rated 28
2. Manual door
3. Typical extruded aluminum frame
4. Detection system excluded from base price

Contemporary Door: Flush door laminated with high pressure laminate or unfinished-wood veneer finish to be selected by customer. (Many different types of laminate are available.)



Contemporary

Viewing Screens: (Per Room)

One (1) Interior RF Viewing Screen with Glazing, Size: 6'-0" x 4'-0", with 3/16" clear tempered glazing on both sides (STC rating: 39)



Tubular Waveguides: (Per Room)

One (1) Tubular Aluminum Cryogen-Exhaust Waveguide, 8" Diameter



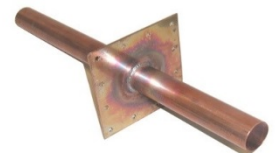
Honeycomb waveguide: (Per Room)

Three (3) HVAC Waveguides (Sizes TBD)



Copper Waveguides: (Per Room)

- One (1) Copper Waveguide for Fire Protection (Diameter TBD)
- Two (2) 1/2" dia. Medical Gas Waveguides
- One (1) 3/4" dia. Medical Gas Waveguide



Electrical Filters: (Per Room)

- *(Data/CAT5 filters not included)
- Five (5) 30-Amp Electrical Filters
 - Two (2) 1-Amp Electrical Filters
 - Two (2) 0.15-Amp Signal Filters
 - One CMRS RF Filter Pack



Other Items: (Per Room)

- One (1) RF Pen Panel Frame for GE Penetration Panel
- One (1) 24"x24" Pressure Relief Waveguide

Budget Price:

[REDACTED]. Payment is due in full after completion of work, thirty (30) days after receipt of invoice. This bid price expires if not accepted by 4/4/2020.

Additional Options:

Option:	Description:	Amount:	Selected:
1.	Upgrade the RF Door to include the Patented PDC Automatic Latching System with two (2) push button actuator switches and electric key switch. (Automatic opener not included). Power circuits and conduit are to be provided by others.	\$5,125	
2.	Upgrade the Patented PDC Automatic Latching System to include a Stanley Magic Force Automatic Door Opener. Option 1 also must be selected.	\$3,900	
3.	Upgrade RF door to include full glass (Glass Dimensions: Approximately 38" x 68"). This option includes the automatic latching system described above.	\$10,925	
4.	Upgrade the Acoustical Rating of RF Door to STC-41. The STC-41 door comes standard with the contemporary finish.	\$2,200	
5.	PDC Patented RF Door Pass Through IV Waveguide. Only available if Option 1 or 2 are selected.	\$3,300	
6.	As a distributor, PDC can offer the FerrAlert™ Ferromagnetic Detection System, along with installation and training provided by Kopp Development Inc.	*	

*See attached literature

Installation Requirements: See attached installation details

PDC requires the contractor to perform the following:

- Install 3/4" plywood ceiling in the scan room.
- Install 3/4" plywood (preferred) or 5/8" drywall on the scan-room side of all four parent walls.
- Supply to PDC [Twenty-Eight] (28) 4' x 8' sheets of 3/4" underlayment plywood for PDC to use to install the RF floor system.
-

Lead Time:

PDC requires a minimum of four (4) weeks after receipt of order and final MRI vendor installation drawings to manufacture and stage the components for an RF-shielded enclosure.

Referenced Drawings: This Budget was prepared using the most current

Terms of Warranty:

PDC warrants the RF installation, including labor and materials, for a period of one (1) year from the date of the final RF Integrity Test. Exceptions to this warranty are the gaskets for the RF door and frame, which have a useful life of less than one year. Additionally, PDC warrants that the RF Fabric material shall be free of physical defect for a period of five (5) years from the effective date on the Warranty certificate. In the event that a material defect is found within the warranty period, PDC shall provide replacement material free of charge in a quantity equivalent to the quantity of defective material. Exceptions for end-user negligence, acts of God, mischief, vandalism, fire, and water damage apply to the warranty.

Notes:

The Contractor is responsible for ensuring that the room is ready to receive the RF-shielding installation when the PDC crew arrives on site as follows:

- PDC has free and clear access to the job site.
- The parent wall (drywall or plywood) and ceiling structure is complete per PDC's installation drawings.
- The room is completely empty and broom-swept.
- The room is properly conditioned and humidity-controlled.
- Contractor to provide means of offloading RF supplies from delivery vehicle and store in safe place within 200' of shielded room.
- Payment/Performance bonds, per project aggregate and waiver of subrogation insurance requirements are not included
- This Budget price is based upon 12-hour work days. Additional charges will be incurred if a shorter work day is specified.

Contractor may not start construction on any interior finished walls in the RF-shielded enclosure until PDC has completed the RF-shielding installation, tested the enclosure, and turned it over to the contractor. Work stoppages not resultant from the actions of PDC will result in additional charges. All work is priced to be performed Monday through Friday. Work performed on Saturday, Sunday, and Holidays will require a change order. Parts and/or labor in excess to those described above will be the responsibility of the Contractor and supplied and installed by PDC on a time and materials basis.

All sales/use taxes are the sole responsibility of the customer/end user. PDC will not be responsible for the collection of any taxes relating to products provided as a result of this proposal/quote/bid.

Thank you for giving us the opportunity to quote this work.

Sincerely,

Matt Boesel
PDC Facilities, Inc.
RF Shielding Division
(262) 367-7944
matt@pdcbiz.com

Customer: Please complete the following section and return to orders@pdcbiz.com	
Customer Signature: _____	Date: _____
Customer Name/Title: _____	
Customer PO #: _____	
PO Amount: _____	



Purchase Orders issued to:
PDC Facilities, Inc.
700 Walnut Ridge Dr.
Hartland, WI 53029
orders@pdcbiz.com

Date: February 3, 2020

To: Amy Dalton – Director of Imaging
Timpanogos Regional Hospital
750 W 800 N
Orem, UT 84057
801-714-6526
Amy.Dalton@Mountainstarhealth.com

Fr: Michael Hemmerly
PDC Facilities, Inc.
317-910-6285
michael.hemmerly@pdcfacilities.com

Proposal 020320TR-1
Caring MR Suite (CMRS)
Timpanogos Regional Hospital - Artist

Dear Amy;

Thank you for the opportunity to submit this proposal for PDC’s Caring MR Suite (CMRS) Electronics, RF Shielding and accessories. The CMRS is designed to provide patients with the ability to control their environment resulting in reduced anxiety and an improved patient experience. Users of the CMRS report reduced sedation requirements, less claustrophobic rejection, less patient motion in the bore and improved work flow.

PDC Facilities, Inc., manufacturers LED Lighting Systems and Patient Experience Solutions that are certified to meet and/or exceed every MRI vendors specification for EMI requirements of having less than 5% ripple. All drive circuitry employs linear regulation and no pulse width modulation (PWM) which is known to cause image artifacts, audible noise and light flicker.

Please refer to the attached Exhibit A-1, corresponding to the Sales Drawings, for a list of CMRS Electronics Equipment included in this proposal.

GE has tested the CMRS Electronic Equipment installed in the PDC RF Shielded Enclosure at GE Headquarters. The GE test summary, approving the electronics, is attached with this proposal. PDC is the only shielding provider certified by GE.

The CMRS Electronic Equipment requires a PDC RF Filter Pack. The RF Filter Pack is installed adjacent to the penetration panel on the RF Shield and provides a shielded connecting point for all CMRS electronic equipment in the MR scan room. The cost of the RF Filter Pack from PDC is \$7,500. The shielding contractor is responsible to purchase and install the RF Filter Pack.

PDC will include the RF Filter Pack in our separate RF Shielding proposal. If you elect to work with a different shielding contractor, they must purchase the RF Filter Pack from PDC and install it prior to testing the RF enclosure per the GE testing protocols.

~~When the CMRS Electronics Package is purchased, PDC provides all lighting in the MR Scan Room. Therefore, the electrical items below do not have to be provided by the site contractor for the MRI Scan Room:~~

- ~~1. MRI compatible LED lights~~
- ~~2. Lighting controls~~
- ~~3. DC Lighting Controller~~
- ~~4. Dimmer controls~~

The following attachments are included and considered part of this proposal:

- CMRS Sales Drawings
- CMRS Electronics detail – Exhibit A-1
- PDC Terms
- CMRS Case Study
- GE Test and Certification Letter
- CMRS Image Ceiling® product literature
- Portable Video Display product literature

Pricing:

Item #	Item Description	List Price	GE Discount	PDC Discount	Net GE Price	Initial to Accept
1	Exhibit A-1 Caring MR Suite Electronics	\$89,619	\$8,962	\$4,481	\$76,176	
2	(3) GE Coil Storage Cabinets - Two Door Cabinet(s)	\$12,075	\$604	\$604	\$10,868	
3	(4) Infill Wall Panel(s)	\$3,100	\$155	\$155	\$2,790	
Total:					\$89,833	
Optional Items to be added to above CMRS Electronics Price						
4	Premium PVD w/Audio	\$57,995	N/A	\$8,699	\$49,296	
5	Patient Observation System; Dual Camera	\$17,466	N/A	\$1,747	\$15,720	
6	Audio/Speaker Only Package - (2) Pair of MR Safe Speakers, Audio Amplifier, MyDevice Cables, Connections to Vendor in-bore audio system.	\$3,650	N/A	N/A	\$3,650	
7	CMRS RF Electrical Filter Pack	\$7,500	N/A	N/A	\$7,500	

Required Internet Connection:

An internet connection supplied by the customer to the PDC equipment is required to provide warranty support and software updates.

PDC Discount:

PDC may photograph and take video of the installation upon completion. The photographs and video, if taken, will be provided to the customer for their use and also used for PDC’s marketing effort. The customer may be asked for a testimonial, either verbal or on video. Reference calls may be requested as well as a possibility of site visit request. Show site status will remain in effect as long as the warranty is valid.

Construction:

The Site Contractor is responsible for all construction work and installation of PDC Electronics as identified by “SC” on the Exhibits included in this proposal. Interior finishes are not included in this proposal.

Extended Warranty:

PDC offers an Extended Warranty that will provide for replacement of all equipment that may fail to perform as designed, provide all software updates and deliver all new themes. Contact PDC for an Extended Warranty proposal.

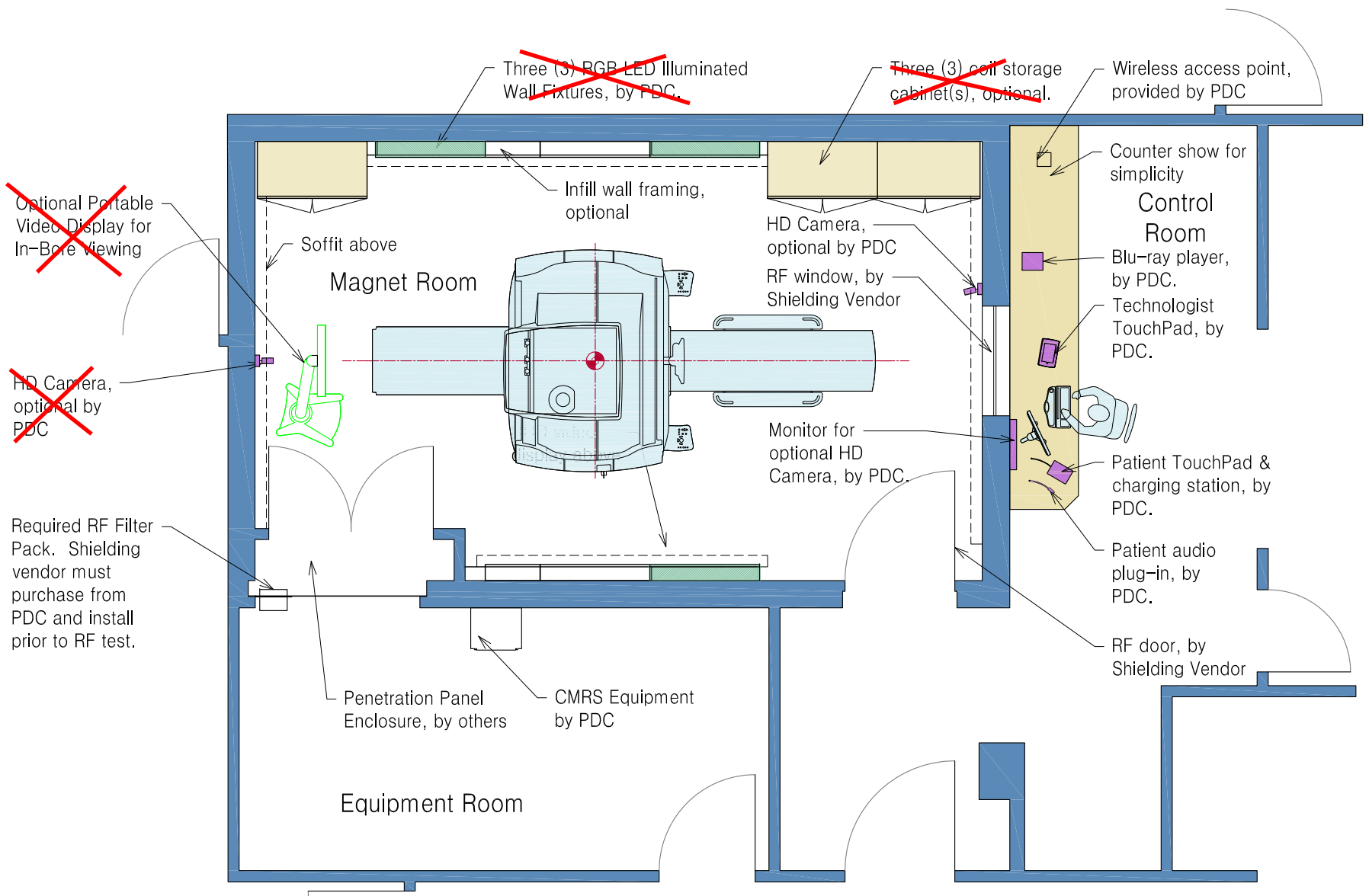
To view videos of the CMRS click on the links below:

- [In-Bore Video](#) See what the patient sees
- [Sample Themes](#) See customer videos and sample themes
- [On The World Wide Web](#) Visit PDC’s website
- [IV Waveguide](#) See how it works. No need to disconnect the patient
- [Semi-Automatic RF Door](#) Opens and closes effortlessly
- [Fully Automatic RF Door](#) Opens and closes with the touch of a button

Thank you for the opportunity to submit this proposal. Please contact me if you have any questions or would like to discuss installation details.

Sincerely,

Michael Hemmerly
PDC Facilities, Inc.



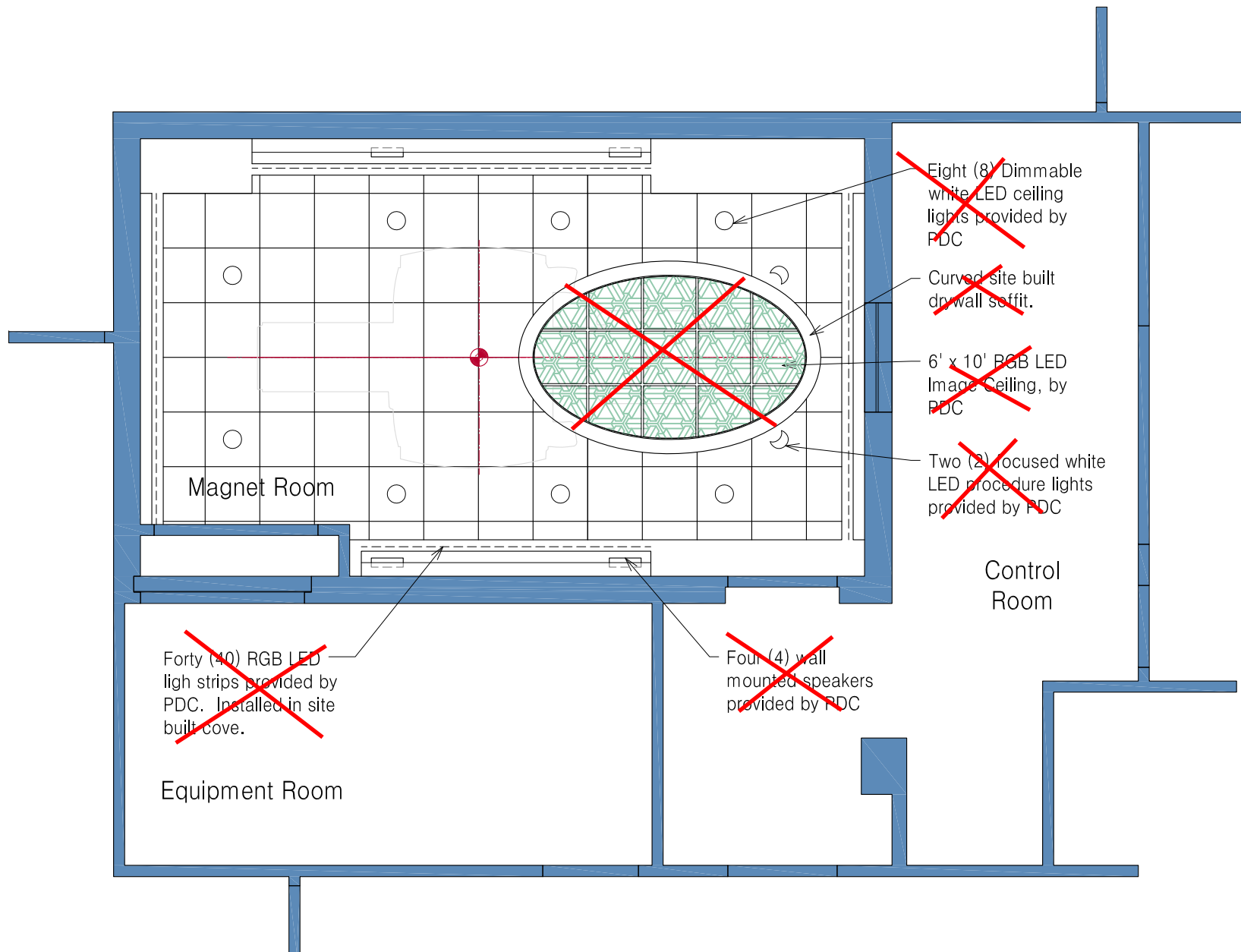
GE Caring MR Suite® Floor Plan

3/16" = 1'-0"

Timpanogos Regional, Orem, UT

Manufactured by: PDC Facilities, Inc. 700 WALNUT RIDGE DRIVE HARTLAND, WISCONSIN 53029 (262) 367-7700

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GE Caring MR Suite® Reflected Ceiling Plan

3/16" = 1'-0"

Timpanogos Regional, Orem, UT

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Caring MR Suite Electronics				
Timpanogos Regional Hospital		SC = Site Contractor		
		PDC = PDC Facilities, Inc.		
		CMRS = Caring MR Suite		
Qty	Documentation	Provided By	Installed By	Notes
1	Electronics and electrical installation drawings, Data Sheets, Manuals and Warranty Statements	PDC	N/A	Installation details provided by PDC
Lighting - MRI Scan Room				
3	RGB LED Standard Illuminated Wall Panels w/Fern Design	PDC	SC	Wiring by SC
8	White LED Recessed Low Profile 6" Lights	PDC	SC	Wiring by SC
2	Patient Procedure Focused Recessed Light	PDC	SC	Wiring by SC
40	RGB LED Light Strips - 1 meter length, Installed in a site-built cove by the SC	PDC	SC	Wiring by SC
Oval Image Ceiling - MRI Scan Room				
6	2'x4' Image Ceiling® Fixtures - Custom	PDC	SC	Installation details provided by PDC
2	2'x2' Image Ceiling® Fixtures - Custom	PDC	SC	Installation details provided by PDC
1	2'x2' Image Ceiling® Fixtures - Standard	PDC	SC	Installation details provided by PDC
15	2'x2' Image Ceiling® Tiles	PDC	SC	Installation details provided by PDC
1	0-10V Sliding Dimmer	PDC	SC	Wiring by SC
1	Customer Selected/Sentient Supplied Image	PDC	N/A	PDC to contact Customer
Technologist and Patient - Control Room				
1	Technologist Tablet & Control Station	PDC	PDC	Wiring by SC, final connection by PDC
1	Patient Control App & Hardware Interface Software	PDC	PDC	Provided and installed by PDC
Mechanicals - Equipment Room				
1	DC LED Lighting Control System w/ Dimming	PDC	SC	Wiring by SC
1	Installation Cable Kits	PDC	SC	Wiring by SC, final connection by PDC
1	Commissioning Kit	PDC	PDC	Wiring by SC, final connection by PDC
Site Support				
1	Delivery of CMRS Components	PDC	PDC	Delivery to site by PDC
1	Commissioning - PDC Technician on site to provide installation verification and start-up	PDC	PDC	CMRS Technician On Site
1	Training - Applications Instruction at Customer Site	PDC	PDC	Applications/Training On Site one (1) day
	Note: The CMRS RF Filter Pack is not included in this price	RF Vendor	RF Vendor	RF Vendor must purchase the RF Filter pack from PDC and install it prior to the RF test
List Price For the CMRS Electronics \$89,619			Refer to Terms sheet for payment, delivery and warranty	



February 3, 2020

Terms:

PDC Proposal 020320TR-1 is valid until August 3, 2020.

Payment terms are Net 15 days after invoice without set-off or retainage. A partial invoice (90%) will be issued upon shipping of product. A final invoice (10%) will be issued upon completion of training.

All sales/use taxes are the sole responsibility of the customer/end user. PDC will not be responsible for the collection of any taxes relating to products provided as a result of this proposal/quote/bid.

Images for the back-lit Image Ceiling® may be selected from the [PDC Image Gallery](#).

Warranty is twelve (12) months on all materials.

Delivery is included. Owner or contractor is required to receive, unload and safely store all materials. Damage must be reported upon receipt.

Receipt, off-loading and installation of the purchased items by owner's contractor.

Purchase Orders must be issued to:

PDC Facilities, Inc.
700 Walnut Ridge Dr.
Hartland, WI 53029
orders@pdcbiz.com
Attention: Jared Galassini
JGalassini@pdcbiz.com
Direct: 262-367-7959

Reference Proposal – 020320TR-1

Purchase Orders are not considered effective until acknowledged by PDC in writing.

After a purchase order is received, PDC will collaborate with the customer's architect to prepare installation drawings. Typical lead times are 6-8 weeks after receipt of Purchase Order. Lead times may exceed 8 weeks for orders containing custom lighting fixtures or custom software.

CASE STUDY SUMMARY – CARING MR SUITE®

Healthcare Organization: A study was conducted by a Top-10 Non-Profit Health System with over 500 care sites to determine the “Payback Period” of a Caring MR Suite®. This organization has nine (9) PDC Caring MR Suites®.

Objective: Compare the financial performance of a MR Suite without a Caring MR Suite® to a suite installed with a Caring MR Suite®. The goal was (1) to determine whether there is a financial benefit associated with a Caring MR Suite® and (2) if there is a financial benefit, what is the ROI period.

Customer’s MR Suite: The Caring MR Suite® and RF Shielding were provided by PDC.

Study Duration: Twelve-month analysis comparing the financial performance of the MR with a PDC Caring MR Suite® to their MR Systems without the Caring MR Suite®.

Results:

- ✓ Anesthesia:
 - Outpatient anesthesia is 56.9% lower in the MR with the Caring MR Suite®
 - Hospital based Inpatient anesthesia dropped from 9.5% of patients in MR suites without a Caring MR Suite® to 2.4% of patients in the MR with the Caring MR Suite®
- ✓ Escape Rate / Patient Terminations: were 85% lower in the MR with the Caring MR Suite®
- ✓ Revenue from increased scans: revenue was \$825,000 higher in the Caring MR Suite®*
- ✓ Net Income: was \$260,000 higher in the Caring MR Suite®
- ✓ Payback Period attributable to Caring MR Suite®: 6.7 months. Payback was calculated using net income rather than cash flow.

*Increased revenue was determined to accrue from:

- ✓ Improved workflow, more scans were completed on schedule, more appointments
- ✓ Reduced anxiety, re-scans, patient stops and escapes improved productivity
- ✓ Fewer anesthesia patients increased scans per day and reduced expense
- ✓ Increased patient satisfaction lead to referrals with patients travelling from up to 100 miles away
- ✓ Happy patients lead to happy relaxed MRI Technicians and staff, leading to increased productivity

[Case Study Link](#)

PDC Website: www.pdcbiz.com

PDC Testimonial & Patient Experience Solutions Videos:

- [PDC Caring MR Suite® Patient Testimonial](#)
- [PDC Caring MR Suite® Customer Testimonial](#)
- [PDC Caring MR Suite® Example Theme Video](#)
- [PDC Portable Video Display \(PVD\)](#)
- [PDC RF Privacy Glass RSNA Video](#)
- [PDC Semi-Auto Full Glass RF Door RSNA Video](#)

To: PDC Facilities, Incorporated
Attn. Jim Maslowski
700 Walnut Ridge Drive
Hartland, WI 53029


Milwaukee February 6, 2012

To Whom It May Concern,

This letter certifies that measurements of radiated emissions have been taken in GEHC MR Customer Bay 6, equipped with a Discovery MR750w, 3.0T MR system, with the Caring MR Suite System (Part No. 900-001) from PDC Facilities, Inc. The testing concluded that the RF noise level emitted from the Caring MR Suite System will be acceptable to allow the Discovery MR750w 3.0T Scanner to meet System Performance Tests: SNR and CNT. Based on the test results, the following conclusions are applicable:

- 1) The Caring MR Suite (Product No. 900-001) is not expected to degrade the image quality nor affect the MR Scanner performance to meet System Functional Tests SNR and CNT of the Proton (1H) frequency band for MR Systems with field strength of 3.0T and 1.5T.
- 2) The Caring MR Suite (Product No. 900-001) is not expected to degrade the image quality nor affect the MR Scanner performance to meet System Functional Tests SNR and CNT of the tested MNS frequency band for 13C, 23Na, 31P, 129Xe, 19F, and 3He for MR Systems with field strength of 3.0T.

The complete test report can be found in DOC1100227 "Radiated Emissions Test Report Bay6 PDC Caring MR Suite." SNR and CNT are tools used to assess system performance in the presence of radiated emissions. The testing was executed on the "Discovery MR750w with GEM" product, but is applicable to the "Discovery MR450w with GEM" product as well.



Bo Pettersson

Premium PL Program Manager



IMAGE CEILINGS & VIRTUAL WINDOWS



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- ELEVATE PATIENT SATISFACTION
- INCREASE EXAM PRODUCTIVITY

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CONTACT: MICHAEL HEMMERLY 317-910-6285 michael.hemmerly@pdcfacilities.com

The **PDC** Image Ceiling and/or Image Window light up any space with your choice of nature or custom images. Compatible with just about all Radiology and Oncology modalities, this is an easy way to create a calming and patient centric environment in your exam rooms and/or patient waiting areas. Our LED lighting options include warm white and color changing RGB, with or without Touch Control integration.



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PDC

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- IMPROVE PATIENT COMFORT
- REDUCE PATIENT MOTION
- REDUCE NEED FOR SEDATION
- INCREASE PATIENT SATISFACTION
- INCREASE MR PRODUCTIVITY



Click or Scan QR code
for testimonial videos

Contact: Michael Hemmerly

317-910-6285

michael.hemmerly@pdcfacilities.com

The **PDC** Portable Video Display is specifically designed for patients allowing them to experience in-bore viewing regardless of patient orientation. For head first patients, Prism Glasses or a Head Coil Mirror is utilized. For feet first imaging, GE Healthcare's Comfort Tilt Technology or a pillow may be all you need! The HD Portable Video Display can be rotated 180 degrees mechanically and/or 360 degrees digitally. The very rugged rolling base features an articulating arm for optimum patient viewing positioning. The Portable Video Display seamlessly integrates with PDC's Caring MR Suite®.



By allowing your patients the pleasure of feet first imaging and breathtaking nature scenes, they may ask your MR Technologist to add a few more sequences!!



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•

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Electrical Addendum #1

Date: August 28, 2020
To: Gary Blazzard
Company: HKS Architects
Job: Timpanogos MRI
Job No: 20200075
Cc:

From: Jason Worthen, PE, LEED AP
Email: jrwspectrum-engineers.com
Phone: 801-401-8442
Re:

This Addendum shall be considered part of the Contract Documents and Project Manual for the above mentioned project as though it had been issued at the same time and shall be incorporated integrally therewith. Where provisions of the following supplementary data differ from those of the original Contract Documents and Project Manual, the Addendum shall govern and take precedence.

Electrical Addendum

Questions

1. Will the owner be providing anything such as access control, structured cabling nurse call system? Or do we included all of these costs in our bid.
 - a. These items are not owner provided and should be included in the contractors bid/scope of work.
2. Data Cable has Cat6A UTP Listed - Belden 2413 is Cat 6, please clarify.
 - a. CAT6 is correct.
3. Data Jack is listed as Cat6A Black - Belden number is incomplete, please clarify.
 - a. Refer to updated sheet.
4. Data Faceplate is listed as Angled MDVO KIT, can we use flat key connect? Please clarify.
 - a. That is acceptable.
5. Patch Panels are listed as Angled - Part Number is Flat, Fully Loaded, please clarify.
 - a. Patch panels should be flat.
6. Horizontal Wire Managers are listed as Panduit - HCA Spec is Belden, please clarify.
 - a. Belden is correct, spec will be updated accordingly

Specifications

Drawings

Section 271000 – Voice Data Cabling



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1. Changed approved manufacturer for distribution racks and wire management to Belden.
2. Added cable identification color coding.

Drawings

1. ET001 – Telecomm Symbols
 - a. Revised equipment/cable list.
 - b. Revised general project notes.

END OF ADDENDUM

Attachments: Specification section 271000, Sheet ET101.

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MRI Retrofit
Orem, Utah**

SECTION 271000 - STRUCTURED CABLING (VOICE-DATA) DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Division 26 Sections apply to this section:
 - 1. Basic Electrical Requirements.
 - 2. Basic Electrical Materials and Methods.
 - 3. Electronic Systems Electrical
- C. Requirements of the following Division 27 Sections apply to this Section:
 - 1. Basic Electronic Systems Materials and Methods.

1.2 SUMMARY

- A. This Section includes complete installation of voice/data distribution components as an addition to an existing local area network. Install completely so system will be fully operational when telephone/data instruments and network/switching equipment are connected. Items that are part of this work include, but are not limited to the following:
 - 1. Cat 6 UTP 4 pair cabling.
 - 2. Telecommunications outlets.
 - 3. Patch panels.
 - 4. Cable Management.
 - 5. Labeling.
 - 6. Patch Cords.
 - 7. Terminations and all accessories.
 - 8. Equipment rack.
- B. This section requires that rough-in materials for this section be provided by the Division 26 installer for installation under Division 26. Rough-in materials include but are not limited to conduit, junction boxes, pathways in corridors, and through wall sleeves. Cable, wall cable management, and j-hooks for this section shall be provided by the Division 27 installer.
- C. Backbone vertical cabling and terminations to the new rack shall be provided by the Owner.

1.3 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for system components.
 - 1. Prior to purchasing any equipment or materials, a list of their manufacturers shall be submitted for review.
 - 2. Prior to assembling or installing the telecommunications work, the following shall be submitted for review:

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Orem, Utah**

- a. Catalog information, factory assembly drawings and field installation drawings as required for a complete explanation and descriptions of all items and equipment.
- C. Upon request, submit for approval a sample of each of the following:
1. Each type of cable.
 2. Each type of cable connector.
 3. Complete outlet assembly including frame, jacks, and cover plate.
 4. Each type of identification label.
 5. Other items as requested.
- D. Record of field tests of system.
- E. Documents will not be accepted for review unless:
1. They include complete information pertaining to appurtenances and accessories.
 2. They are submitted as a package where they pertain to related items.
 3. They are properly marked with specific service or function, and intended location of use within the project (i.e., voice TR and MC termination).
 4. They are clearly identified or highlighted to indicate all items which are applicable.
 5. They indicate the project name and address along with the Contractor's name, address and phone number.
 6. They are properly marked with external connection identification as related to the project where they consist of standard factory assembly or field installation drawings.
- F. Shop drawing Review
1. The Contractor shall submit for approval system shop drawings which include pin configurations, cable runs, punch down blocks, patch panels, conduit, systems/materials and riser diagrams and workstation or other terminations. The Contractor shall keep all documentation current throughout the installation and build-out process. If changes occur which affect any documentation, the Contractor shall formally re-issue the affected documentation to the Owner at the completion of the installation.
 2. The purpose of the review of shop drawings is to maintain the integrity of the design. Unless the contractor clearly points out changes, substitutions, deletions or any other differences between the submission and the Contract Documents in writing on the Contractor's letterhead, approval by the Engineer or Architect does not constitute acceptance. It is not to be assumed that the engineer has read the text nor reviewed the technical data of a manufactured item and its components except where the Vendor has pointed out differences between his product and the specified model.
 3. It is the responsibility of the contractor to confirm all dimensions, quantities, and the coordination of materials and products supplied by him with other trades. Approval of shop drawings containing errors does not relieve the contractor from making corrections at his expense.

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4. Substitutions of equipment, systems, materials, must be coordinated by the Contractor with his own or other trades which may be involved with the item, such as, but not limited to, equipment substitutions which change telecommunications or electrical requirements, or hanging or supporting weights or dimensions.
 5. Any extra charges or credits which may be generated by other trades due to substitutions will not be accepted unless the Contractor has an agreement in writing with the Owner.
 6. Substitutions of equipment, system, etc. requiring approval of local authorities must comply with such regulations and be filed at the expense of the Contractor (should filing be necessary). Substitutions are subject to approval or disapproval by the Engineer. The contractor in offering substitution shall hold the Owner and Engineer harmless if the substituted item is an infringement of patent held by the specified item.
- G. The Contractor shall establish cable records during the installation. These records shall correlate workstation number, distribution cable number, punch down block or frame assignments, conduit or duct path and station location. These records shall be updated as the project progresses to reflect any required changes. As built Records/Drawings will be furnished as specified and accepted by Owner.
- H. All manufacturer's product data including specifications and installation instructions will be provided to the Owner upon acceptance of the space by the Owner.

1.4 QUALITY ASSURANCE

- A. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.
- B. Installers Qualifications: Belden certified and experienced in voice/data distribution system installation similar to that indicated for this project and that have a record of successful performance for a period of 5 years minimum.
1. Factory certification: The installer shall have factory trained and certified technicians on the jobsite at all times for the products and installation methods used in this project.
- C. New equipment and installation shall comply with the following:
1. ANSI/TIA/EIA -568-C, "Commercial Building Telecommunications Cabling Standard", 2002.
 2. ANSI/TIA/EIA -569-C, "Commercial Building Standard for Telecommunications Pathways and Spaces", 2012.
 3. ANSI/TIA/EIA -606A, "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings", 1993.
 4. ANSI/TIA/EIA -607A, "Commercial Building Grounding and Bonding Requirements for Telecommunications", 1994.
 5. NFPA 70, National Electric Code
- D. New equipment and installation shall:
1. Be Underwriters Laboratories, Inc. (U.L.) labeled and/ or listed where specifically called for, or where normally subject to such U.L. labeling and/ or listing services.

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2. Be clearly labeled identifying the transmission parameters specified (specifically with reference to Category ratings).
 3. Be without blemish or defect.
 4. Be in accordance with the latest applicable standards.
 5. Be products which meet with the acceptance of the agency inspecting the telecommunications work.
- E. All items of equipment or material of one generic type shall be the product of one manufacturer throughout.
- F. It is the intent of these specifications that wherever a manufacturer of a product is specified, and the terms "other approved" or "or approved equal" or "equal" are used, the substitute item must conform in all respects to the specified item. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance.
- G. Substituted equipment or optional equipment where permitted and approved, must conform to space requirements. Any substituted equipment that cannot meet space requirements, whether approved or not shall be replaced at the Contractor's expense. Any modifications of related systems as a result of substitutions shall be made at the Contractor's expense.
- H. Note that the approval of shop drawings, or other information submitted in accordance with the requirements hereinbefore specified, does not assure that the Engineer, Architect, or any other Owner's Representative, attests to the dimensional accuracy or dimensional suitability of the material or equipment involved or the ability of the material or equipment involved or the mechanical performance of equipment. Approval of Shop Drawing does not invalidate the plans and specifications if in conflict, unless a letter requesting such change is submitted and approved in the Engineer's letterhead.
- I. Substitutions of Telecommunications Equipment for that shown on the schedules or designated by model number in the specifications will not be considered if the item is not a regular cataloged item shown in the current catalog of the manufacturer.
- J. Manufacturer's Recommendations: Where installation procedures of any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of the recommendations shall be furnished prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.
- K. Connected Equipment Manufacturer Approval: Where cables specified in this Section are used to provide signal paths for systems specified in other sections of these Specifications or for systems furnished under other contracts, obtain review of the cable characteristics and approval for use with the connected system equipment by the connected equipment manufacturers.
- L. "Nationally Recognized Testing Laboratory" (NRTL) Listing: Provide materials that are listed and labeled.
1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.
 2. FCC Regulations: Comply with FCC Part 68, Chapter 1, "US Code of Federal Regulations," Title 47 for all telephone system wire and cable connection components.

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- M. Toxicity: Comply with applicable codes and regulations regarding toxicity of combustion products of materials used in control/signal transmission media.
- N. Coordination of Work: Coordinate the Work of this Section with the requirements of the Owner's voice/data system suppliers, existing conditions, and any of the off premises utility organizations.
 - 1. Meet jointly with the representatives of the Owner and any utility representatives, to exchange information and agree on details of installation interfaces, any work involving existing equipment and the installation of new infrastructure thereto, T568A or B wiring standards, and any other circumstances that impact on the completion of the work of this Section.
 - 2. Record agreements reached in the meeting and distribute the record to the other participants.

1.5 DESCRIPTION OF STANDARD TELECOMMUNICATIONS ASSEMBLIES

- A. The pair configuration for all twisted-pair cables shall conform to the industry standards for multi-pair cables and shall be color coded using the Western Electric color code scheme.
- B. The contractors shall be responsible for insuring that the installation of all equipment be performed in accordance with manufacturer's specifications. The necessity of special conditions required by a particular manufacturer shall be brought to the attention of the engineer prior to the installation of any equipment in the area concerned.

1.6 WARRANTY

- A. Project Warranty: A written warranty agreeing to replace and install voice/data distribution system components that fail in materials or workmanship, or do not meet manufacturer's official published specifications and performance criteria within the warranty period specified below. This includes both labor and materials. This warranty shall be in addition to, and not a limitation of, other rights and remedies the Owner may have against the Contractor under the Contract Documents.
- B. Special Project Warranty Period: 5 years minimum, beginning on the date of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cable factory-packaged in containers or reels. Store in clean dry space and protect products from damaging fumes and traffic. Handle wire and cable carefully to avoid damage.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate with installation of electrical boxes and fittings, and raceways for subsequent installation of cable/wire.
- B. Sequence installation of cabling systems with other work to minimize possibility of damage during construction. Contractor is responsible for replacing and or repairing damaged materials during installation, such as wall finishes, ceiling tile, grid, etc.

PART 2 - PRODUCTS

2.1 EQUIPMENT/CABLING LIST

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- A. The parts referred to in the drawings or specifications are recommended types. Where acceptable substitutes are available from only one vendor, no substitutions will be permitted. The owner or his representative reserve the right to examine and approve any and all parts acquired to satisfy the installation requirements, and to reject these parts without penalty if they do not meet with the specifications.
- B. The items indicated by a specific manufacturer shall not be construed as a "bill of materials". They represent items of significance used during the design of the cabling installation. Where the items indicated are one portion of an assembly, the entire assembly shall be provided unless specified otherwise. Where items do not have a manufacturer or part number listed, no particular item has been selected at this time.
- C. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Cable:
 - a. Belden Inc.; Electronics Division.
 - 2. Rack Terminal and Connector Components:
 - a. Belden/CDT.
 - 3. Distribution Racks and Wire Management:
 - a. Belden Inc.
- D. Voice/Data distribution (LAN) system equipment racks
 - 1. General Frame Requirements:
 - a. Distribution Frames: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
 - b. Module Dimension: Width compatible with EIA 310 standard, 19-inch panel mounting.
 - c. Finish: Manufacturer's standard, baked-polyester powder coat.
 - 2. Floor-Mounted Racks: Modular-type, steel or aluminum construction.
 - a. Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug, and a power strip.
 - b. Baked-polyester powder coat finish.

2.2 UTP CABLE AND WIRING COMPONENTS

- A. General: Provide cable and wiring components of manufacturer's standard materials as indicated by published product information, designed and constructed as recommended by manufacturer, for a complete installation and for applications indicated. See schedules in drawings and specifications.
- B. Data Grade Systems:

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1. Cable: Provide 4 pair, 24 gauge, category 6 UTP cable that meets or exceeds the requirements for channel and link performance as stated in ANSI/TIA/EIA 568-C.1 and C.2- Provide plenum rated cable in all areas.
2. Terminations: Unless otherwise indicated, all cable shall be terminated at patch panels and at workstations.
3. Patch Panels: Rack-mounted, modular type with RJ45 connectors. Provide quantity of ports to accommodate the number of outlets shown on drawings plus 25%. Patch panels shall be provided for Category 6 UTP and all equipment shall meet current industry standards.
4. Workstations: Shall be an 8-pin modular jack that mounts to a frame or faceplate. The jacks shall be appropriate for the type and category of UTP cable being installed, i.e., category 6 cable shall have category 6 termination unless otherwise noted.
5. Patch Cables: Category 6, terminated with RJ-45 connectors. Provide one for each station cable terminated to the LAN rack patch panels. Provide length and quantity as necessary to complete interconnection to owner switches based on the rack elevation drawings and submittal shop drawings. Minimum length is 6 feet.

C. Identification

1. Network data, telephones, printers, tracker monitors, CCTV: Cable jackets and jacks shall be black.
2. RFID/RTLS: Cable jackets shall be purple.
3. CATV: Cable jackets and jacks shall be blue.
4. Physiological Monitoring: Cable jacket and jack shall be orange.
5. Nurse call: Cable jackets shall be green.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Distribution System: Unless indicated otherwise, provide all terminations and accessories for cables being provided in this project. Install completely so system will be fully operational when telephone/data instruments and switching equipment are connected.

3.2 EXAMINATION

- A. Examine areas and conditions, with Installer present for compliance with requirements for installation and other conditions affecting telephone distribution systems performance. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 WIRING INSTALLATION

- A. General: Install telephone/data distribution systems, cabling and components in accordance with manufacturer's written instructions and in compliance with NEC and applicable ANSI/TIA/EIA requirements. Coordinate installation of transmission media with other Work.
- B. Install cable without damaging conductors, shield, or jacket. Do not either in handling or installation bend cable to smaller radii than minimum recommended by manufacturer. Ensure that medium manufacturer's recommended pulling tensions are not exceeded. Pull cable simultaneously where more than one is being installed in same raceway. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Use

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pulling means, including fish tape, cable, rope, and basket weave wire/cable grips that will not damage media or raceway.

- C. Wiring Method: Install horizontal cabling in cable management tray and/or hooks. Installations that use the suspended ceiling to support cable will not be accepted.
- D. Exposed Cable: Install parallel or perpendicular to surfaces or exposed structural members and follow surface contours where possible.
 - 1. Cable Support: Secure cable to independent supports at intervals not greater than 5 feet to prevent sagging between supports. Use metallic supports with corrosion-resistant finish.
- E. No splices are allowed except at indicated termination points.
- F. Wiring in Termination Rooms and Cabinets: Install conductors parallel to and at right angles to walls. Bundle, wrap, and train the conductors to terminal points with sufficient service loop. Use wire distribution spools at points where cables are fanned or conductors turned. Label each terminal with designations approved by the Owner. Wiring on racks, patch panels, and at riser UTP blocks shall be installed through wire-management devices.
- G. Conductor Terminations: Terminate conductors of cables on terminal blocks and hardware using tools recommended by the manufacturer.

3.4 GROUNDING

- A. Provide grounding connections for cable and other system components as required by manufacturer's written instructions and TIA/EIA 607, "Grounding and Bonding of Telecommunications Systems".
- B. All ground connectors in the main telecommunications equipment rooms and telecommunications closets shall be made to the ground bars provided for that purpose as part of the electrical work.
- C. All metal panels, enclosures, boxes, racks, raceways, etc. in computer rooms, telecommunications equipment rooms and closets shall be grounded.
- D. Conductors utilized for grounding and bonding shall not be less than #6 AWG and shall have type "TW" or better insulation, color coded green.

3.5 IDENTIFICATION AND TAGGING FOR TELECOMMUNICATIONS DEVICES

- A. Identify individually:
 - 1. Each and every telecommunications cable.
 - 2. Each outlet (and each port).
 - 3. Each termination block and patch panel (and each termination).
 - 4. Each equipment termination frame and cabinet.
 - 5. Each junction box used for telecommunications wiring.
 - 6. Each system (i.e., voice, Data, fiber, etc.) as identified by the engineer.
 - 7. Other items as directed.
- B. The nomenclature used to identify cables, blocks, equipment, etc. shall be as specified on the drawings or elsewhere in this specification. Missing or unclear nomenclature criteria for the items specified above shall not be construed as a reason not to identify the items and shall be brought to the attention of the Owner.

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- C. All materials required for labeling shall be provided by the contractor. All labels shall be permanently adhered, easily visible and shall be resistant to smearing. All text shall be typed (not handwritten). All cables shall be labeled at both ends minimum.

3.6 FIRE-STOPPING:

- A. Firestopping shall be provided for all penetrations of conduit, wireways, bus ducts, cable trays, etc., through fire-rated walls and floors and other fire-rated separations as follows:
 - 1. Excess space in framed openings through structural floors between conduits and concrete shall be grouted in with concrete to a depth of at least the thickness of the slab plus 2" minimum above the slab.
 - 2. Conduit penetration through poured concrete or masonry walls shall be grouted in with concrete and provided with tight fitting escutcheon plates on both sides.
 - 3. Conduit penetrations through fire-rated dry walls shall be with sleeves through the wall fitted with escutcheon plates on both sides with excess openings filled with fire stop material specifically manufactured for the purpose.
 - 4. Excess space within conduit sleeves or stubs through floor slabs or walls where low voltage/ telecommunications cables pass through shall be filled with firestopping material specifically manufactured for the purpose.
 - 5. Utilize fire-rated fittings, as specified elsewhere for penetrations through floor slabs for supplying floor outlets.
- B. All conduits/sleeves used for vertical cable passage shall be sealed utilized suitable material after the installation of cables as follows:
 - 1. The material shall be non-corrosive to the cable jacket or insulation that it applies to.
 - 2. The material shall provide for a minimum of three (3) hour fire rating.
 - 3. The material shall be non-shrinking, waterproof and smoke tight. The material shall remain flexible and non-hardening.
 - 4. The material shall be of the type that when installed will not slip through the openings, will stick to the surfaces of the openings and the cable and will not require any pressure to be applied to the cable in order to keep it in place.
 - 5. The material shall be installed in a neat and workmanlike manner and the final installation shall be smooth finished to the top of the sleeve or conduit.
 - 6. The material shall be easily removable without damaging the cables after being set or cured for at least one week.
- C. All horizontal cable penetrations through rated walls shall be sealed in a manner that will provide a fire rating equal to the wall construction.
- D. Upon completion of the telecommunications work, the contractor will certify that all openings for the cables satisfactorily sealed and fire stopped.

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- E. All materials used for firestopping shall be approved for the purpose and the rating of the wall or floor and all methods employed shall meet with the approval of the local authorities.
- F. Refer to architectural drawings and specifications for all locations of fire rated walls and floors.

3.7 TESTING

- A. Before an application for final acceptance of the telecommunications work will be considered, all tests deemed necessary by the Owner and Engineer to show proper execution of the voice and data wiring work shall have been performed and completed in the presence of the Owner's representative. Scheduling of all testing procedures shall be arranged to suit the convenience of the Owner.
- B. Test specified to be performed in this document are intended to verify the quality of all cabling. This document also establishes a uniform method of reporting the test results for evaluation by the Engineer and Owner.
- C. All tests are to be performed upon completion of the initial installation.
- D. Performing the indicated tests does not constitute equipment or circuit acceptance.

3.8 TEST EQUIPMENT

- A. The equipment indicated below represents test equipment utilized to develop this test specification. Substitute test equipment may be used, upon approval by the Engineer, provided the same level and quality of testing is performed.

- 1. Twisted pair (Cat 6)

<u>PRODUCT</u>	<u>PRODUCT NUMBER</u>
Fluke Networks	DTX CableAnalyzer

Utilize accessories as required (refer to manufacturer's handbook):

- B. Prior to any testing being performed, the Engineer shall be supplied with a list of test equipment to be used, for his review and approval, if not the equipment identified in this specification. The submittal shall include documentation indicating that the proposed equipment is capable of performing all of the tests as required by this specification.

3.9 TESTS TO BE PERFORMED

- A. Tests are to be performed on the following aspects of the voice/data distribution cabling system:
 - 1. From each Termination Room (TR) termination to each and every workstation termination.
 - 2. Any other telecommunications inter-building or station cable which forms a portion of this installation.
- B. All cable runs for which equipment will not initially be attached must be tested to the same level of compliance as all other cabling.
- C. Prior to any acceptance testing being performed, a sample test shall be performed for each series of tests (i.e., copper, fiber, etc.). The sample test shall consist of a regular acceptance test on a

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few sample cables as selected by the contractor. The Engineer shall be given a minimum of one week notice so he and/ or his representative may observe the test.

- D. The Contractor is responsible for testing each telephone and data circuit installed and is to certify that each circuit is fully operational from the workstation to the MC prior to notifying the Owner that the space is ready for inspection and acceptance. All testing will be in accordance with ANSI/TIA/EIA 568-C standards. The contractor will maintain and provide to the Owner an operational test log. This will provide a chronological list, including but not limited to the following: all significant events, including equipment/ facility reactions, meter readings, etc. obtained during the testing phase.
- E. All wiring, wiring connections and equipment provided by the contractor shall be tested in the presence of a representative of the Owner. The record of the test results will be submitted to the Owner's representative within seven (7) days of said test.
- F. Testing for certification will not occur until after all construction has been completed, carpet laid to ensure that the installation is not injured after testing.
- G. Test results and written certification will be entered on forms previously approved by the Owner's Technical Representative and returned to the Owner within seven (7) days after testing.
- H. Data Grade Cable (Category 6)

The following tests shall be performed on all pairs of each UTP cable.

- 1. Test equipment
 - Fluke Networks DTX CableAnalyzer
- 2. Tests to be performed
 - a. The test equipment shall be configured to test the maximum transmission performance for which the cable is rated (i.e. Cat 6 = 250 Mbps).
 - b. The following minimum information shall be provided for each cable and pair to be tested:
 - 1. Length - find the total cable length.
 - 2. Resistance - measured for each cable pair.
 - 3. Noise - measured for each pair at the following frequencies: 10Hz - 150KHZ - 16 MHZ, - 100MHZ, -250MHZ.
 - 4. Insertion Loss (dB loss) - measured for each pair at 250 MHZ.
 - 5. Near End Cross Talk (NEXT) - measured in dB and the associated frequency.
 - 6. Power Sum NEXT - measured in dB.
 - 7. Attenuation to Cross Talk (ACR) - measured in dB.
 - 8. Far End Cross Talk (ELFEXT) - measured in dB.
 - 9. Power Sum ELFEXT - measured in dB.

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- 10. Return Loss - measured in dB.
 - 11. Wire map - indicate that the wiring at the near end and far end are as specified.
- c. Installer shall show that the complete installation meets category 6 requirements.

3.5 RECORD OF TEST RESULTS

- A. A record of all required tests shall be provided to the Engineer and Owner. The information shall be permanent record for the purposes of maintenance and restoration.
- B. A brief description outlining the test equipment used and a single line diagram indicating the test setup shall be provided to the Engineer for his review. The level of description should be sufficient enough to allow an individual who is not familiar with the specific test equipment to recreate any portion of the test.
- C. Test results to be provided shall contain the following minimum information:
 - 1. For all similar cable runs include:
 - a. Project name.
 - b. Description of test (i.e., voice riser, workstation cable, etc.)
 - c. Cable origin
 - d. Cable destination
 - e. Cable ID
 - f. Cable pair/ strand
 - g. Test date
 - h. Tester (individual responsible for conducting the test)
 - i. Page____ of _____
 - j. An initial block for Owner witness for each separate testing requirement.
 - l. A signature block for the Owner witness.
 - 2. For copper cables:
 - a. No shorts, no crosses, no breaks
 - b. For the indicated pairs of the cables include:
 - 1) Length
 - 2.) Resistance
 - 3.) Noise @ 10 Hz - 150 Khz

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150KHz - 15 Mhz
16 Mhz - 250 Mhz

- 4.) Attenuation (dB) at 10 Mhz
 - 5.) Near end cross talk (NEXT) and the associated frequency
 - 6.) Wire map
 - 7.) Test equipment settings.
- D. While it is recognized that the test results will be completed in the field, it is important to note that they will serve as record documents. Therefore, care should be taken in the recording of the test results. The final product is expected to be done in a neat and legible manner.
- E. Some test equipment has the ability to record test results to a printer or memory for printing later. Submitting of these printed test forms is preferred in lieu of handwritten forms. Some test equipment also has the ability to store the tests results to disk media. The test results are required on disk to associate the information with a cable management database. All test results shall be provided in the following formats:
1. Printed (1 bound copy).
 2. Disk or Flash media.
- F. A copy of the test results in both electronic and printed formats shall be provided to the Engineer for his review and the Owner for his records.

3.6 CORRECTIVE ACTION

- A. Any defects or deficiencies discovered in any of the telecommunications work shall be indicated on the test report and be corrected.
- B. Upon completion of testing and problem resolution, all connections tested are to be 100% error free for all horizontal workstations.
- C. Any connections determined to be not correctable shall be indicated at each end of the termination as "bad" (in red) - backbone/ riser.

3.7 COMMISSIONING

- A. Subsequent to hookups of telephone/data distribution systems, operate control/signal systems to demonstrate proper functioning. Replace malfunctioning media with new materials, and then retest until satisfactory performance is achieved.
- B. Documentation: Use the above test equipment to make a strip chart recording of transmission characteristics, wave form, and performance of all segments of the installation at the time of commissioning. Record loss data in a form with provision for at least 50 additional loss data entries during future maintenance operations. Bind the recordings in a cable record book indexed for easy reference during future maintenance operations and turn book over to the Owner's authorized representative.

END OF SECTION 271000

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CABLE/OUTLET COLOR SCHEDULE	
COLOR	TYPE
BLACK	TV COAX

EQUIPMENT/CABLE LIST

THE ITEMS INDICATED BELOW SHALL NOT BE CONSTRUED AS A "BILL OF MATERIALS". THIS LIST IDENTIFIES ITEMS OF SIGNIFICANCE USED DURING THE DESIGN OF THE CABLING INSTALLATION. WHERE THE ITEMS INDICATED ARE ONE PORTION OF AN ASSEMBLY, THE ENTIRE ASSEMBLY SHALL BE PROVIDED UNLESS SPECIFIED OTHERWISE. PROVIDE ALL MISCELLANEOUS HARDWARE AND SUPPORTS WHICH MAY NOT BE LISTED HERE, FOR A COMPLETE INSTALLATION. COMPARE CATALOG NUMBERS WITH DESCRIPTIONS AND NOTIFY ENGINEER OF DISCREPANCIES PRIOR TO BID. IF CATALOG NUMBERS DO NOT MATCH DESCRIPTIONS, THE DESCRIPTIONS TAKE PRECEDENCE. PROVIDE COMPLETE SUBMITTAL FOR APPROVAL PRIOR TO PURCHASING ANY EQUIPMENT OR CABLE. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

ITEM SYMBOL	ITEM DESCRIPTION	ACCEPTABLE TYPES
	STATION CABLE, DATA - CATEGORY 6A UTP, PLENUM, BLACK, DATA	BELDEN 2413010
▽	DATA OUTLET, SINGLE GANG FACEPLATE, WHITE, 4 POSITION	BELDEN AX106663
	CATEGORY 6A JACK - DATA, BLACK	BELDEN AX10166
	BLANK INSERT, WHITE	BELDEN AD405538
▽	DATA OUTLET, SINGLE GANG FACEPLATE, WHITE, 4 POSITION	BELDEN AX106663
	CATEGORY 6A JACK - DATA, BLACK	BELDEN AX10166
	BLANK INSERT, WHITE	BELDEN AD405538
4	DATA OUTLET, SINGLE GANG FACEPLATE, WHITE, 4 POSITION	BELDEN AX106663
	CATEGORY 6A JACK - DATA, BLACK	BELDEN AX101666
[SPP]	48 PORT, 2RU ANGLE PATCH PANEL WITH OUTLETS	BELDEN AX103255
[HWM]	HORIZONTAL WIRE MANAGERS, 4RU	PANDUIT NCMHAE4

NOTE: ALL RACKS, LADDER, PATCH PANELS AND ACCESSORIES SHALL BE BLACK IN COLOR

GENERAL PROJECT NOTES

- UNLESS OTHERWISE NOTED, INSTALL ALL CABLE INSIDE RACEWAY SYSTEMS. WHERE RACEWAY SYSTEMS HAVE NOT BEEN PROVIDED OR SPECIFIED, INSTALL CABLE THROUGH THE SPECIFIED "CADDY" CLIPS AT THE MINIMUM INTERVALS IDENTIFIED IN THE SPECIFICATIONS. SUPPORT "CADDY" CLIPS DIRECTLY FROM THE BUILDING STRUCTURE, NOT FROM OTHER BUILDING SYSTEM SUPPORT WIRES OR CABLE.
- PROVIDE PLENUM RATED CABLE IN ALL AIR PLENUMS. IF A PLENUM RATED CABLE IS NOT SPECIFIED, PROVIDE THE PLENUM RATED EQUIVALENT TO THE SPECIFIED CABLE.
- LABEL ALL CABLE INSTALLED UNDER THIS CONTRACT REGARDLESS OF LENGTH.
- THE EQUIPMENT LABELING IDENTIFIED ON DETAILS IN THESE DRAWINGS ARE EXAMPLES ONLY OF THE ACTUAL LABELING WHICH IS REQUIRED AS PART OF THIS CONTRACT. PRIOR TO FABRICATION, SUBMIT THE NOMENCLATURE FOR ALL LABELS TO THE OWNER FOR REVIEW. THIS REQUIREMENT INCLUDES BUT IS NOT LIMITED TO ALL CABLE LABELING, AND ALL EQUIPMENT LABELING.
- IF OUTLET IS TERMINATED IN CEILING SPACE, LABEL THE T-BAR GRID WITH THE OUTLET NUMBER FOR EASY LOCATION AND IDENTIFICATION.
- GROUND ALL EQUIPMENT RACKS INSTALLED UNDER THIS CONTRACT IN COMPLIANCE WITH THE CONTRACT DOCUMENTS.
- FOR EVERY CABLE PULL SPECIFIED, COIL 15' OF EXCESS CABLE AT THE STATION END FOR FUTURE USE. NEATLY COIL 15' ABOVE THE CEILING OR BELOW FLOOR WHERE APPLICABLE.
- PROVIDE THE QUANTITY OF PATCH PANELS REQUIRED +20% FOR THE TOTAL DATA OUTLETS SHOWN ON FLOOR PLANS FOR THE PARTICULAR LEVEL.
- RACK SPACE ALLOCATION SHOULD BE FOLLOWED PER DRAWINGS. IF YOU HAVE A SYSTEM THAT HAS NOT RACK ALLOCATION PLEASE CALL BOE SAUSEDAD AT 801-707-3805.
- ALL DATA LOCATIONS ARE NOT SHOWN IN ET SHEETS. REFER TO ENLARGED POWER PLANS FOR DATA LOCATIONS IF NOT SHOWN ON ET SHEETS.

ABBREVIATIONS

NOTE: ALL ABBREVIATIONS MAY NOT BE USED.

A	AUGMENTED
CAT	CATEGORY
E	ENHANCED
EA	EACH
ER	EQUIPMENT ROOM
FPP	FIBER PATCH PANEL
GIG	GIGA HERTZ
HWM	HORIZONTAL WIRE MANAGEMENT
NIC	NOT IN CONTRACT
OE	OWNER ELECTRONICS
PNM	PLENUM
PR	PAIR
PS	POWER SUPPLY
RPP	RISER PATCH PANEL
SPP	STATION PATCH PANEL
TC	TELECOMMUNICATIONS ROOM
TYP	TYPICAL
VWM	VERTICAL WIRE MANAGEMENT

DEFINITIONS

NOTE: ALL DEFINITIONS MAY NOT BE USED.

INDICATED: THE TERM "INDICATED" REFERS TO GRAPHIC REPRESENTATIONS, NOTES, OR SCHEDULES ON THE DRAWINGS, OTHER PARAGRAPHS OR SCHEDULES IN THE SPECIFICATIONS, AND SIMILAR REQUIREMENTS IN THE CONTRACT DOCUMENTS. WHERE TERMS SUCH AS "SHOWN", "NOTED", "SCHEDULED", AND "SPECIFIED" ARE USED, IT IS TO HELP THE READER LOCATE THE REFERENCE. NO LIMITATION ON LOCATION IS INTENDED.

DIRECTED: TERMS SUCH AS "DIRECTED", "REQUESTED", "AUTHORIZED", "SELECTED", "APPROVED", "REQUIRED", AND "PERMITTED" MEAN "DIRECTED BY THE ENGINEER", "REQUESTED BY THE ENGINEER", AND SIMILAR PHRASES.

APPROVE: THE TERM "APPROVED", WHERE USED IN CONJUNCTION WITH THE ENGINEER'S ACTION ON THE CONTRACTOR'S SUBMITTALS, APPLICATIONS, AND REQUESTS, IS LIMITED TO THE ENGINEER'S DUTIES AND RESPONSIBILITIES AS STATED IN GENERAL AND SUPPLEMENTARY CONDITIONS.

FURNISH: THE TERM "FURNISH" IS USED TO MEAN "SUPPLY AND DELIVER TO THE PROJECT SITE, READY FOR UNLOADING, UNPACKING, ASSEMBLY, INSTALLATION, AND SIMILAR OPERATIONS."

INSTALL: THE TERM "INSTALL" IS USED TO DESCRIBE OPERATIONS AT PROJECT SITE INCLUDING THE ACTUAL "UNLOADING, UNPACKING, ASSEMBLY, ERECTION, PLACING, ANCHORING, APPLYING, WORKING TO DIMENSION, FINISHING, CURING, PROTECTING, CLEANING, AND SIMILAR OPERATIONS."

PROVIDE: THE TERM "PROVIDE" MEANS "TO FURNISH AND INSTALL, COMPLETE AND READY FOR THE INTENDED USE."

INSTALLER: AN "INSTALLER" IS THE CONTRACTOR OR AN ENTITY ENGAGED BY THE CONTRACTOR, EITHER AS AN EMPLOYEE, SUBCONTRACTOR, OR SUB-SUBCONTRACTOR, FOR PERFORMANCE OF A PARTICULAR CONSTRUCTION ACTIVITY, INCLUDING INSTALLATION, ERECTION, APPLICATION, AND SIMILAR OPERATIONS. INSTALLERS ARE REQUIRED TO BE EXPERIENCED IN THE OPERATIONS THEY ARE ENGAGED TO PERFORM.

ELECTRONIC SYSTEMS: THE TERM "ELECTRONIC SYSTEMS" IS USED TO DESCRIBE ALL LOW VOLTAGE SYSTEMS GENERALLY REFERRED TO AS "SPECIAL SYSTEMS". THESE SYSTEMS INCLUDE BUT ARE NOT NECESSARILY LIMITED TO ALL SYSTEMS WHICH UTILIZE VOLTAGES OF LESS THAN 71 VOLTS SUCH AS SOUND SYSTEMS, VIDEO SYSTEMS, TV SYSTEMS, SECURITY SYSTEMS, VOICE AND DATA CABLING SYSTEMS, ETC.

HKS

ARCHITECT

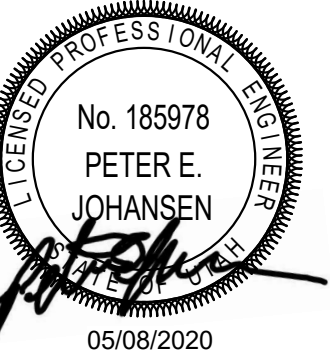
HKS ARCHITECTS, INC.
90 SOUTH 400 WEST, SUITE 110
SALT LAKE CITY, UT 84101

MECHANICAL ENGINEER

VBFA INC.
181 EAST 5600 SOUTH, SUITE 130
MURRAY, UTAH

ELECTRICAL ENGINEER

SPECTRUM ENGINEERS
324 STATE STREET, SUITE 400
SALT LAKE CITY, UTAH



TIMPANOGOS MRI RETROFIT

KEY PLAN

REVISION
NO. DESCRIPTION DATE

1 - Addendum #1 08/28/2020

HKS PROJECT NUMBER

23798.000

DATE

05/08/20

ISSUE

CONSTRUCTION

DOCUMENTS

SHEET TITLE

TELECOMM

SYMBOLS

SHEET NO.

ET001