ALL OR'S SHOULD BE CONSIDERED AS FULLY INTEGRATED WITH VIDEO, VOICE ACTIVATION AND DEVICE/INSTRUMENT CONTROL

TRUMPF

TRUMPF MEDICAL SYSTEMS Inc.
Charleston, SC

PRE-INSTALLATION GUIDE

FOR CEILING MOUNTED EQUIPMENT MANAGEMENT SYSTEMS, SURGICAL / EXAM LIGHTS, AND FLAT PANELS

EMS and Light Pre-installation Guide
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1.0 Introduction

This document is a guide to the steps that must be performed in order to properly prepare a project site for installation of a TRUMPF ceiling suspended system. Covered within this guide are pre-installation requirements for Equipment Management Systems (EMS), surgical light / examination light, and flat panel systems.

1.1 Pre-installation Responsibilities

Generally, work required above the finished ceiling must be performed by the owner or owner designated contractor. All fixed attachments between TRUMPF mounting systems and building super-structures must be approved by the project engineer of record. TRUMPF Technical Service will complete the installation following the conclusion of all required pre-installation activities as detailed within this guide.

1.2 Project Components and Pre-installation Process

Component	Specification Provided By	Materials Provided By	Installation Performed By	Timeline / Project Phase
Structural Mounting Plates and TRUMPF EMS Mounting Systems	TRUMPF Attachment, Substructure, and lateral bracing by Structural Engineer of Record	TRUMPF Lateral Bracing & Substructure (if Req'd.) by Others	Mechanical Contractor	While ceilings are open
Light Power Supply Transformer Enclosures	TRUMPF	TRUMPF	Electrical Contractor	While ceilings are open during electrical installation
Mains Power, Video, Data, and Communication Cables w/ Required J-boxes & Conduits	Owner or Electrical Contractor in accordance to TRUMPF rough-in material	Owner or Contractor	Electrical Contractor	While ceilings are open during electrical install
Integration Cabling for Video and Endoscopy	Integration Company	Integration Company	TRUMPF or TRUMPF assist per contract Terms and Conditions	Cables required at TRUMPF 4-weeks prior to shipment or to field during install per contract Terms and Conditions
Medical Gas Inlet Tubes	TRUMPF	TRUMPF	Medical Gas Contractor	While ceilings are open during plumbing install
EMS, Light, or Flat Panel Suspension	TRUMPF	TRUMPF	TRUMPF	Based on overall construction schedule
Final Equipment Certifications – Med. Gas and Electrical	Local Codes, NEC, and NFPA	Site Inspection	Electrical / Med. Gas Contractor and / or local code inspector	Following equipment installation

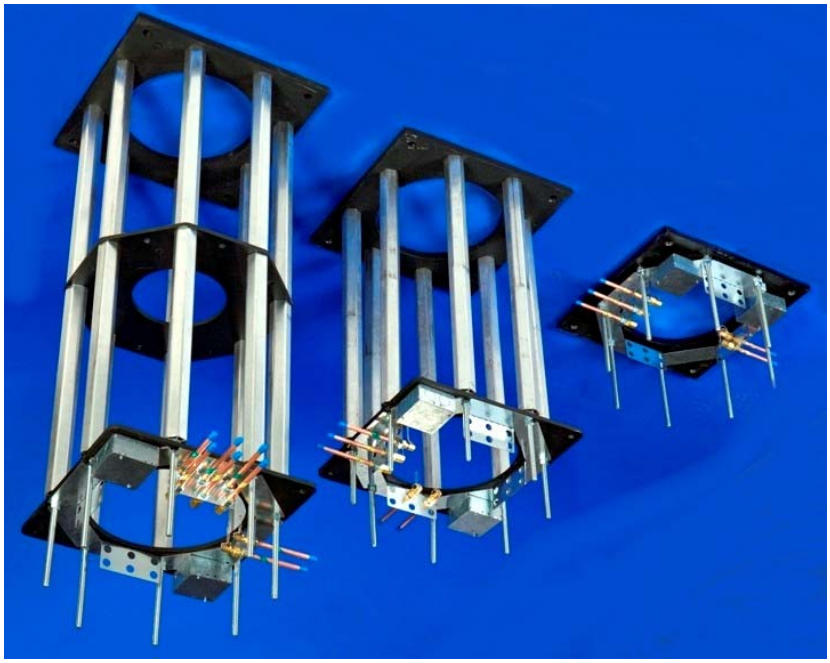
Figure #1) Project Responsibility Matrix

1.3 Safety and Environmental Considerations

- Many components are heavy. Use extreme caution while unpacking shipping containers and installing equipment.
- All personnel working around energized circuits should be qualified and following proper safety procedures.
- All TRUMPF supplied equipment must be stored in clean, dry environments prior to installation.
- Empty packaging material and refuse must be disposed of by the owner in accordance with the governing regulations of local municipalities.

2.0 Equipment Management System (EMS) Mounting Systems

2.1 TRUMPF Pre-engineered EMS Mounting Systems



Picture #1) TRUMPF EMS Mounting Systems

TRUMPF offers pre-engineered mounting solutions for Equipment Management Systems (EMS). TRUMPF boom mounting systems are designed to a 4X factory of safety under the design loads as specified in Section 2.2.

2.2 Design Loads for Equipment Management Systems (EMS)

Fmax.	9,200 N (2067 lbf)
Mbmax.	12,500 Nm (9,220 ft-lbs)

Figure #2) Design Loads (EMS)

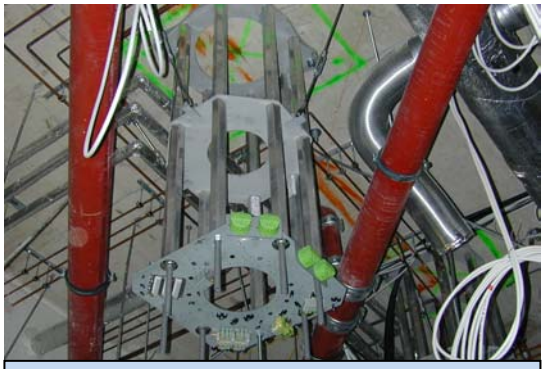
The design loads shown above represent the maximum loading scenario for any TRUMPF ceiling mounted Equipment Management System (EMS). TRUMPF recommends designing all mounts involving booms to this maximum condition in order to maintain flexibility for future product upgrades. Model specific design loads are also available from TRUMPF Project Engineering upon request.

2.3 Attachment Methods for TRUMPF EMS Mounting Systems

SYSTEM WELDED TO STRUCTURE

SYSTEM ANCHORED TO COMPOSITE DECK

SYSTEM BOLTED TO STRUCTURE



SYSTEM ANCHORED TO STRUCTURAL SLAB

Picture #2) TRUMPF EMS Mounting System – Attachment Methods

The TRUMPF EMS mounting system may be attached to the building superstructure in the following manners:

- Welded to superstructure or fabricated substructure.
- Bolted to superstructure or fabricated substructure.
- Anchored to structural concrete slab or structural composite deck.

Notes:

1) ***A custom mounting plate may be required for direct anchorage into composite decks.***
2) ***(4) 1" x 4" ASTM-A307 bolts with nuts, flat washers, and lock washers are recommended for bolted attachment methods. Attachment hardware is provided by others.***
3) ***The Structural Engineer of Record for the project is ultimately responsible for specifying and approving all attachment methods. This includes the specification of weldments, attachment hardware, concrete anchors, and any required lateral bracing.***

2.4 Structural Deflection Criteria (EMS)

- Maximum horizontal deflection of substructure at the attachment point of the TRUMPF mounting plate must not exceed 0.1" when subject to horizontal load of 100lbs.
- Maximum angular deflection of substructure at the attachment point of the TRUMPF mounting plate must not exceed 1/3° from level when subject to the design loads as specified by TRUMPF.

2.5 EMS Mounting System Components

The following components are used to create TRUMPF EMS mounting systems. Not all of the components listed will be required for every type of mounting system. TRUMPF Project Engineering will provide the contractor with a project specific bill of materials drawing prior to any mounting system installation.

- **EMS Mounting Plate (110037)** – Used for attachment of the mounting system to the buildings structural deck or owner furnished sub-structure.
- **Threaded Rod Assembly (110684)** – Used to span interstitial for 11" systems.
- **Adjustable Spacer (337111)** – Hexagonal extrusion and threaded rod assembly used to span interstitial for 14" – 47" systems.
- **Adjustable Spacer Set (337147)** - Two piece hexagonal extrusions and threaded rod assemblies used to span interstitial for 47" – 59" and custom systems.
- **Intermediate Stiffener Plate (110444)** – Used only with 47" – 59", and custom systems.
- **Splice Plate (110213)** – Used as attachment point for lateral bracing if required.
- **Medical Gas Inlet Tube (TBD)** – Used for connection between main supply line and TRUMPF EMS hose.
- **Junction Box (TBD)** – Provided by electrical contractor for termination of circuits.
- **Universal Interface Plate (110344)** – Used to house medical gas inlet tubes and electrical junction boxes.

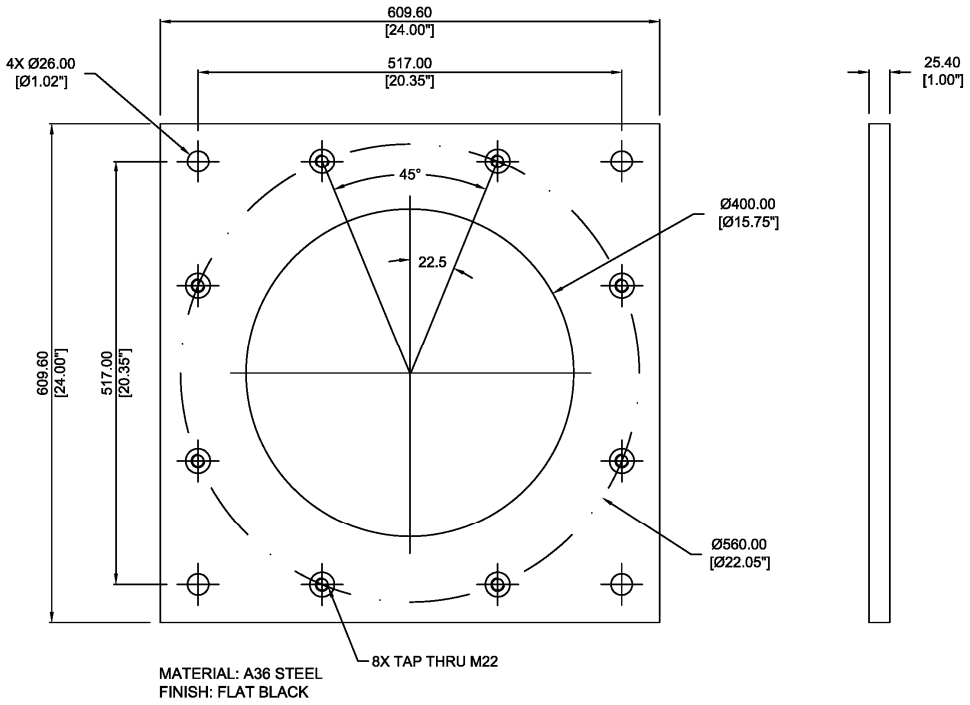
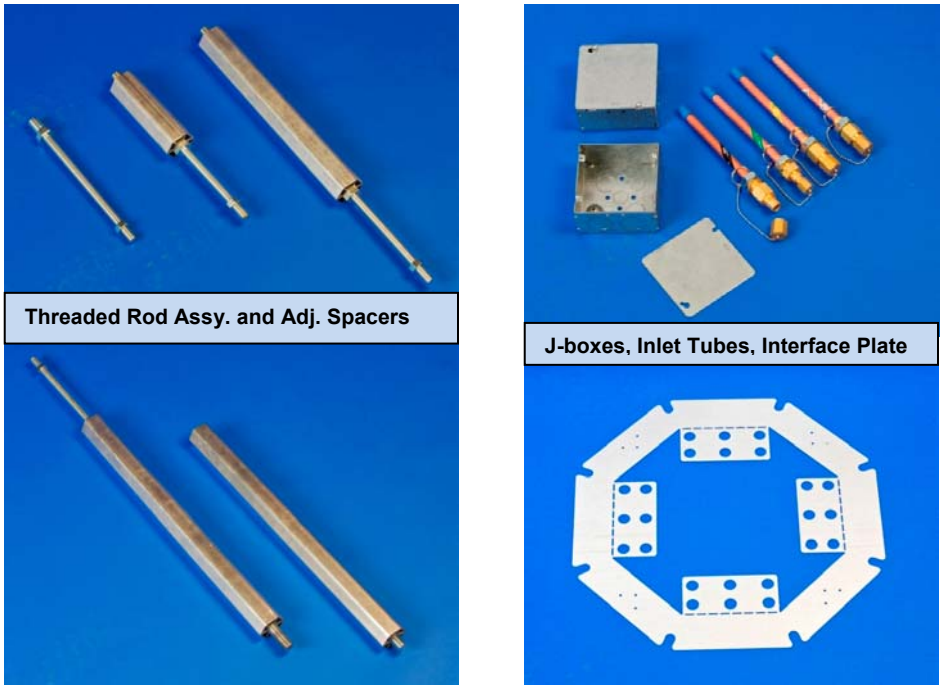


Figure #3) EMS Mounting Plate (110037)



Picture #3) EMS Mounting System Components

2.6 System Configurations and Interstitial Span

The configuration of the TRUMPF EMS mounting system will depend on the length of the interstitial span. Interstitial span is defined by TRUMPF as the distance between the room side of the finished ceiling and the top attachment point of the boom mounting system as shown in Figure #3.

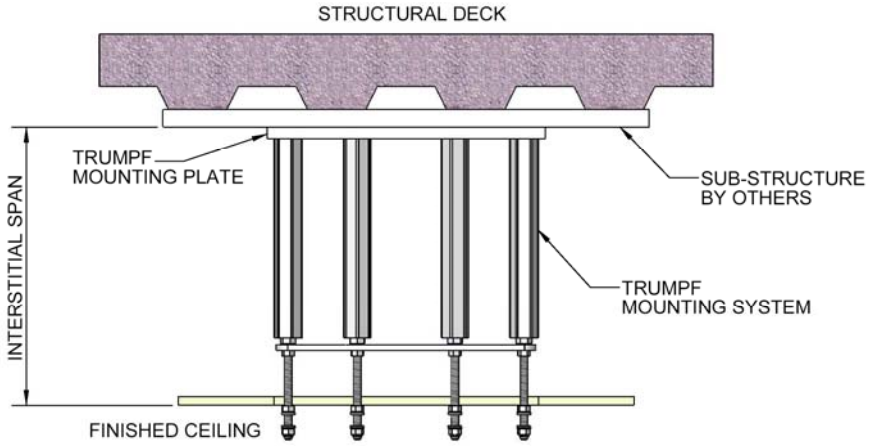


Figure #4: Determining the Interstitial Span for the TRUMPF Mounting System

2.6.1 EMS Mounting System for 8” Interstitial (Catalog #: 110106)

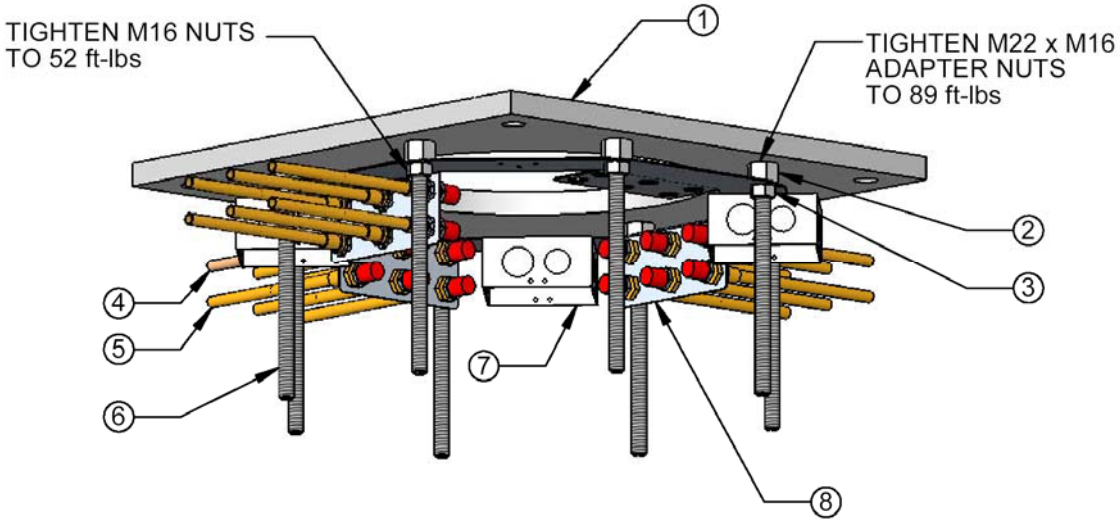


Figure #5) 110106 Mounting System Components (see drawing 110106 for complete rough-in)

The 110106 Mounting System is designed specifically for an 8" interstitial span. The components which make up this system are shown below. Please see drawing 110106 for complete rough-in information.

Components in 110106 Mounting System:

1)	Boom Mounting Plate (110037)
2, 3, 6)	Threaded Rod Assembly (110684)
4)	Inlet Tube for Pneumatic Brakes (TBD)
5)	Medical Gas Inlet Tube (TBD)
7)	Junction Box (By Others)
8)	Universal Interface Plate (110344)

2.6.2 EMS Mounting System for 14" – 47" Interstitial (Catalog #: 110107)

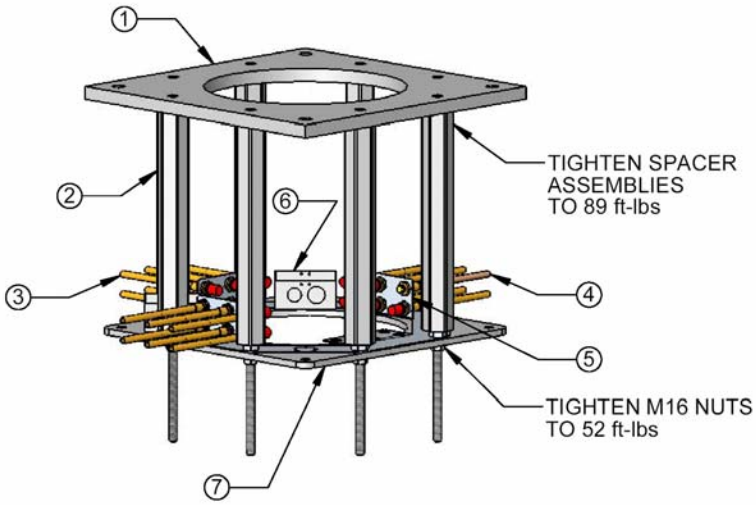


Figure #6) 110107 Mounting System Components (see drawing 110107 for complete rough-in)

The 110107 Mounting System is designed for interstitial span ranges from 14" – 47" (please refer to Figure #4 for calculation of interstitial span). The components which make up this system are shown below. Please see the appendix for complete rough-in information.

Components in 110107 Mounting System:

1)	Boom Mounting Plate (110037)
2)	Adjustable Spacer (337111)
3)	Medical Gas Inlet Tube (TBD)
4)	Inlet Tube for Pneumatic Brakes (TBD)
5)	Universal Interface Plate (110344)
6)	Junction Box (By Others)
7)	Splice Plate (110213) {if required for lateral bracing}

2.6.3 EMS Mounting System for 47” – 59” Interstitial (Catalog #: 110108)

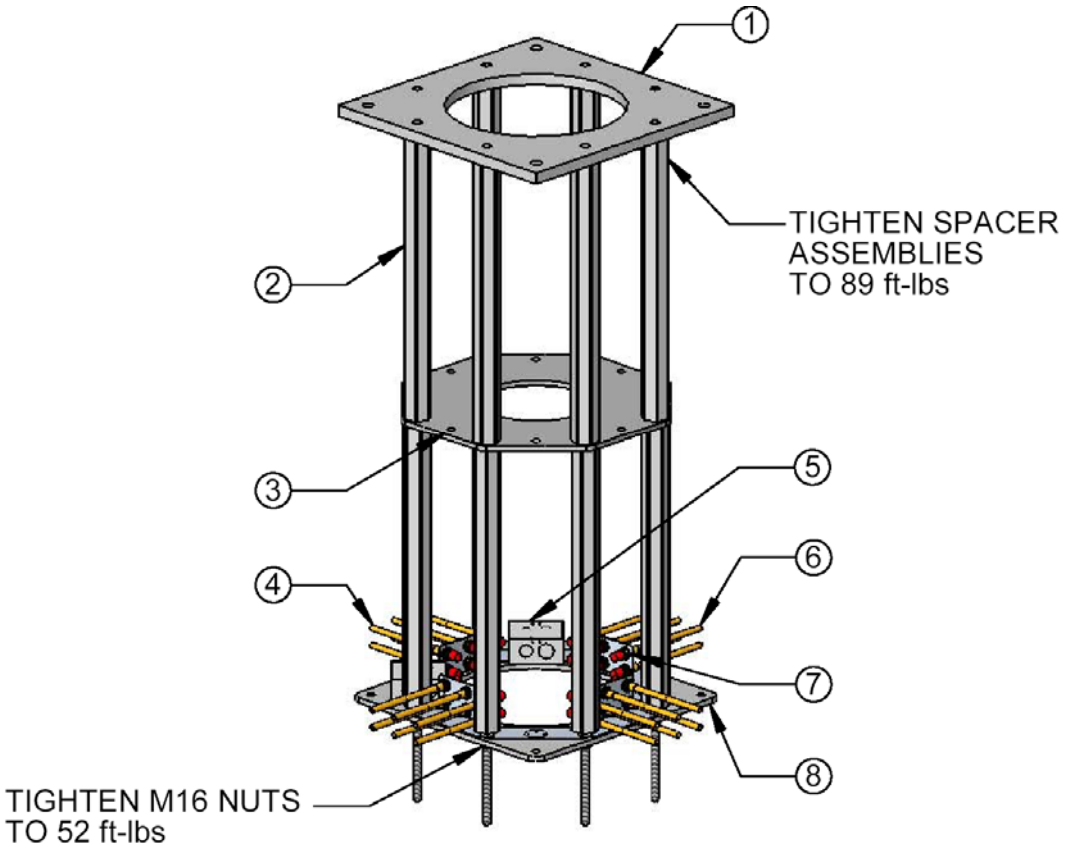


Figure #7) 110108 Mounting System Components (see Drawing 110108 for complete rough-in)

The 110108 Mounting System is designed for interstitial span ranges from 47” – 59” (please refer to Figure #4 for calculation of interstitial span). The components which make up this system are shown below. Please see the appendix for complete rough-in information.

Components in 110108 Mounting System:

1) Boom Mounting Plate (110037)
2) Adjustable Spacer Set (337147)
3) Intermediate Stiffener Plate (110444)
4) Medical Gas Inlet Tube (TBD)
5) Junction Box (By Others)
6) Inlet Tube for Pneumatic Brakes (TBD)
7) Universal Interface Plate (110344)
8) Splice Plate (110213) {if required for lateral bracing}

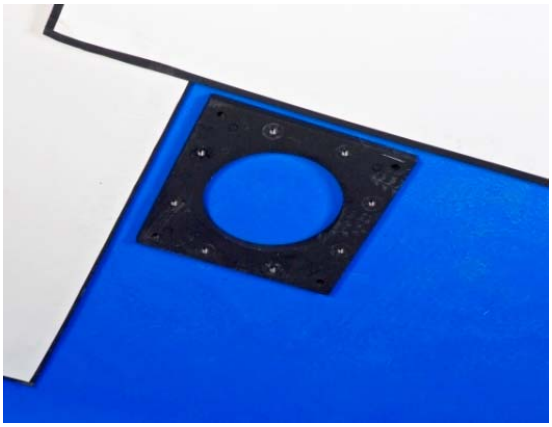
2.7 Installation of TRUMPF EMS Mounting System

The TRUMPF EMS mounting system is supplied by TRUMPF but installed by others. Installation of the EMS mounting plate at the top of the system should be performed while the ceilings are open to ease installation. The complete mounting system will need to be installed prior to the completion of the medical gas and electrical supply lines.

2.7.1 Installation of the EMS Mounting Plate

The standard EMS mounting plate (110037) weighs approximately 100lbs. Therefore, two installers and a manual lift are required for a safe and proper installation.

The mounting location of the EMS mounting plate should be provided by the project architect, and the attachment method given by the structural engineer of record.



Picture #4) Alignment of EMS Mounting Plate

The alignment of the EMS mounting plate should be parallel to the nearest wall or square to the floor plan of the room. If there is a ceiling grid present, the EMS mounting plate should be installed parallel to the grid.

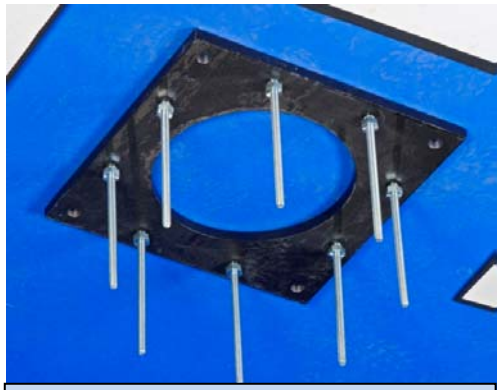
2.7.2 Installation of Threaded Rods or Adjustable Spacers

The standard EMS mounting plate (110037) has (8) M22 tapped holes for attachment of the adjustable spacers or threaded rod assemblies. The M22 mounting studs at the top of these assemblies are designed to stop just short of protruding through the top side of the plate. Eight threaded rod or adjustable spacers are required for every installation, and these must be installed with a target torque of 89 ft-lbs.

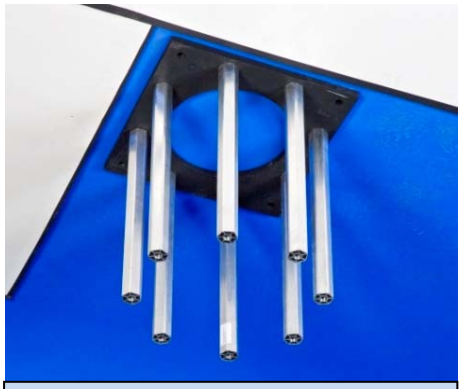
TRUMPF adjustable spacers or threaded rod assemblies can be inserted into the EMS mounting plate by hand, but they must be set to a toque of 89 ft-lbs using a large torque wrench.

Adjustable spacers assemblies are 55mm across flats, and the M22 bolts at the top of the threaded rod assemblies are 30mm across flats.

A total of 8 adjustable spacers or threaded rod assemblies are required for every EMS installation.



Threaded Rod Assemblies (110106



Spacers (110107 and 110108 Systems)

Picture #5) Installing Threaded Rod Assemblies and Adjustable Spacers

Notes:

1) *M16 threaded rods at the lower end of the adjustable spacers should be set to come to rest at 3" below the room side of the finished ceiling for EMS installations with standard 4" deep ceiling covers.*

2) *EMS installations with flat ceiling covers will require the M16 threaded rods to be set at 1" above the room side of the finished ceiling.*

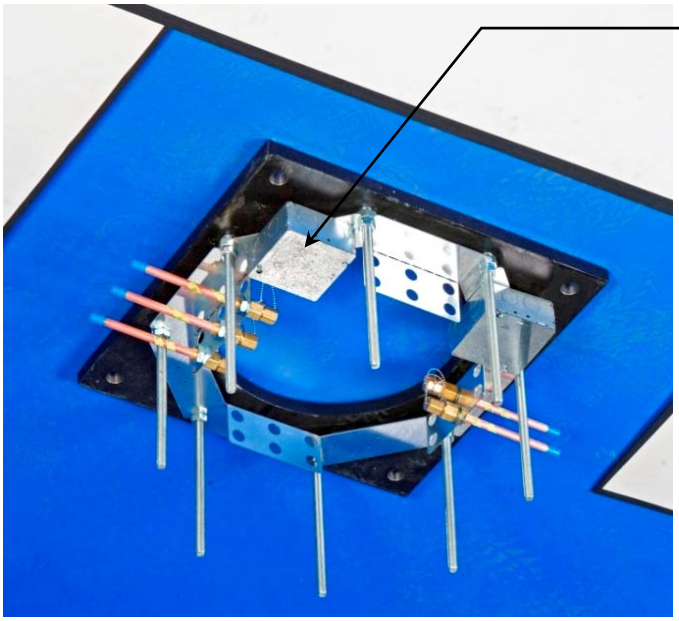
3) *Do not use any thread locking agent on TRUMPF mounting systems.*

4) *Please contact TRUMPF Project Engineering for additional clarification.*

2.7.3 Installation of Interface Plate for Med. Gas and Electrical Connections

The Universal Interface Plate (110344) is designed to house the medical gas inlet tubes for connection between the main gas supply lines and the flexible hoses from the TRUMPF equipment management system. The Universal Interface Plate and medical gas inlet tubes are provided by TRUMPF but installed by others. The Universal Interface Plate also provides a mounting provision for electrical junction boxes that are provided by others for termination of circuit wiring. The Universal Interface Plates are shipped in a flat state, and the tabs that house the medical gas inlet tubes can be bent either upwards or downwards to a 90° position.





The Universal Interface Plate is designed to mount Raco 265 (4-11/16" x 4-11/16" x 2-1/8") junction boxes or similar.

Junction boxes are provided by others.

Medical gas inlet tubes are provided by TRUMPF. A separate inlet tube is provided for each gas outlet on the EMS.

Medical gas inlet tubes are installed by others, and the arrangement of the tubes can be field specified, but DISS connections must face the interior of the mount.

Picture #6) Installing the Universal Interface Plate and Med. Gas Inlet Tubes

Gas inlet tubes are brazed into supply lines via a 1/2" OD copper connection, 1/2" copper tubing is approximately 7" long. Inlet tubes have male DISS connections with internal check valves for connection to flexible hosing from the equipment management system.

2.8 EMS Pneumatic Braking System

TRUMPF Equipment Management Systems utilize pneumatic braking systems to control arm positioning. A separate supply line must be added to each mount for the pneumatic braking system. TRUMPF will supply a gas inlet tube for each mount according to the type of gas that is selected for the pneumatic braking system. The pneumatic brake inlet tubes will be installed by others.

Notes:

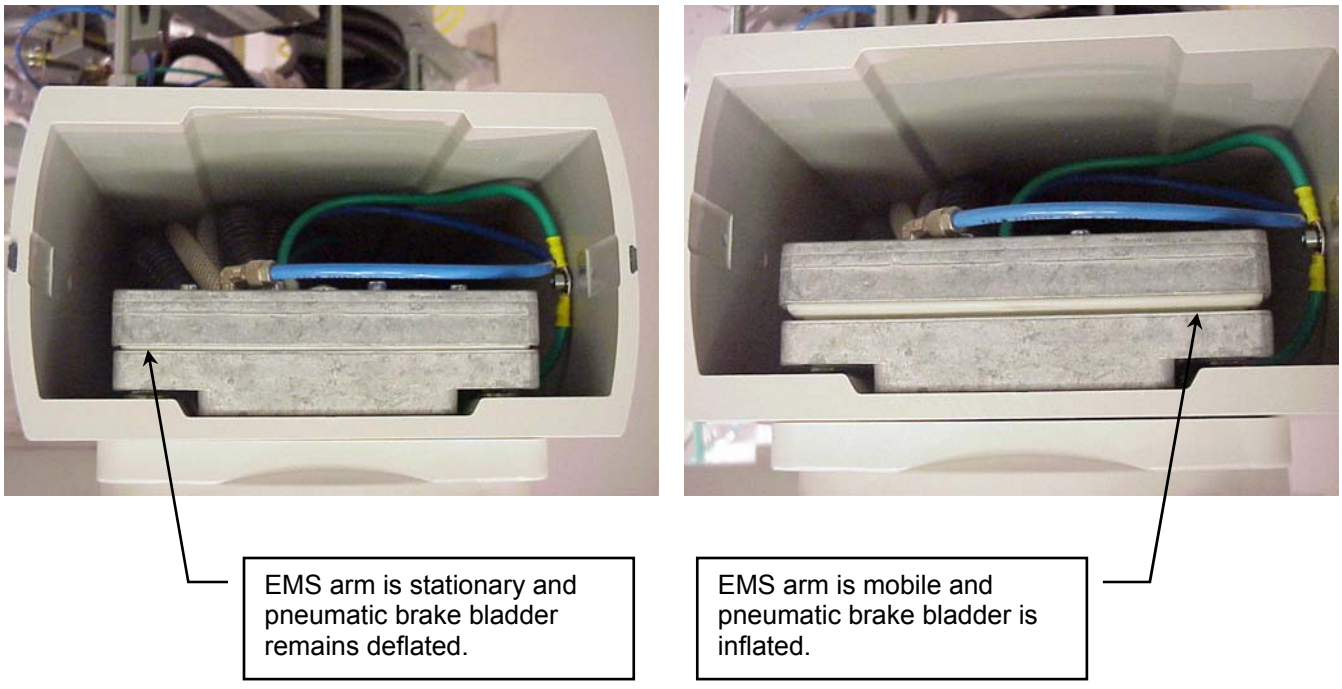
1) Pneumatic braking systems can run on either Nitrogen or compressed air.

2) Line pressure must be regulated by others to be 55 – 70 psig.

3) TRUMPF pneumatic braking systems use 0.004 ft^3 of gas per actuation.

4) The braking system is actuated 3-4 times each time that an EMS is repositioned.

5) A friction brake prevents arm drift while the EMS is stationary. When repositioning, the brake bladder is filled and the friction brake is lifted from the bearing surface



Picture #7) EMS Pneumatic Brakes

3.0 Surgical Light and Flat Panel Systems

Picture #8) Surgical Light and Flat Panel Suspension

For TRUMPF surgical light and flat panel suspensions a substructure must be fabricated on-site by others to support the light and flat panel suspension system. TRUMPF will supply a system mounting plate for attachment to the substructure. The attachment method at this location must be approved by the structural engineer of record.

3.1 Design Loads for Surgical Light and Flat Panel Systems

Fmax.	1,780 N (400 lbf)
Mbmax.	2,033 Nm (1,500 ft-lbs)

Figure #8) Design Loads (Surgical Light and Flat Panel Systems)

The design loads as stated are representative of a maximum load configuration. TRUMPF recommends that all surgical light and flat panel structures are designed to this maximum condition in order to maintain flexibility for future project upgrades.

3.2 Structural Deflection Criteria (Lights and Flat Panels)

- Maximum horizontal deflection of substructure at the attachment point of the TRUMPF mounting plate must not exceed 0.1” when subject to horizontal load of 100lbs.
- Maximum angular deflection of substructure at the attachment point of the TRUMPF mounting plate must not exceed 1/3° from level when subject to the design loads as specified by TRUMPF.

3.3 Design Elevations for Substructure

The TRUMPF surgical light and flat panel suspension system can be configured to have either a flat cover to conceal the ceiling cutout or it can be configured with a 150mm (6") deep ceiling cover to conceal the ceiling cutout. ***Typically a flat ceiling cover is specified for all new construction projects.*** The following two figures show the target elevations for both types of systems.

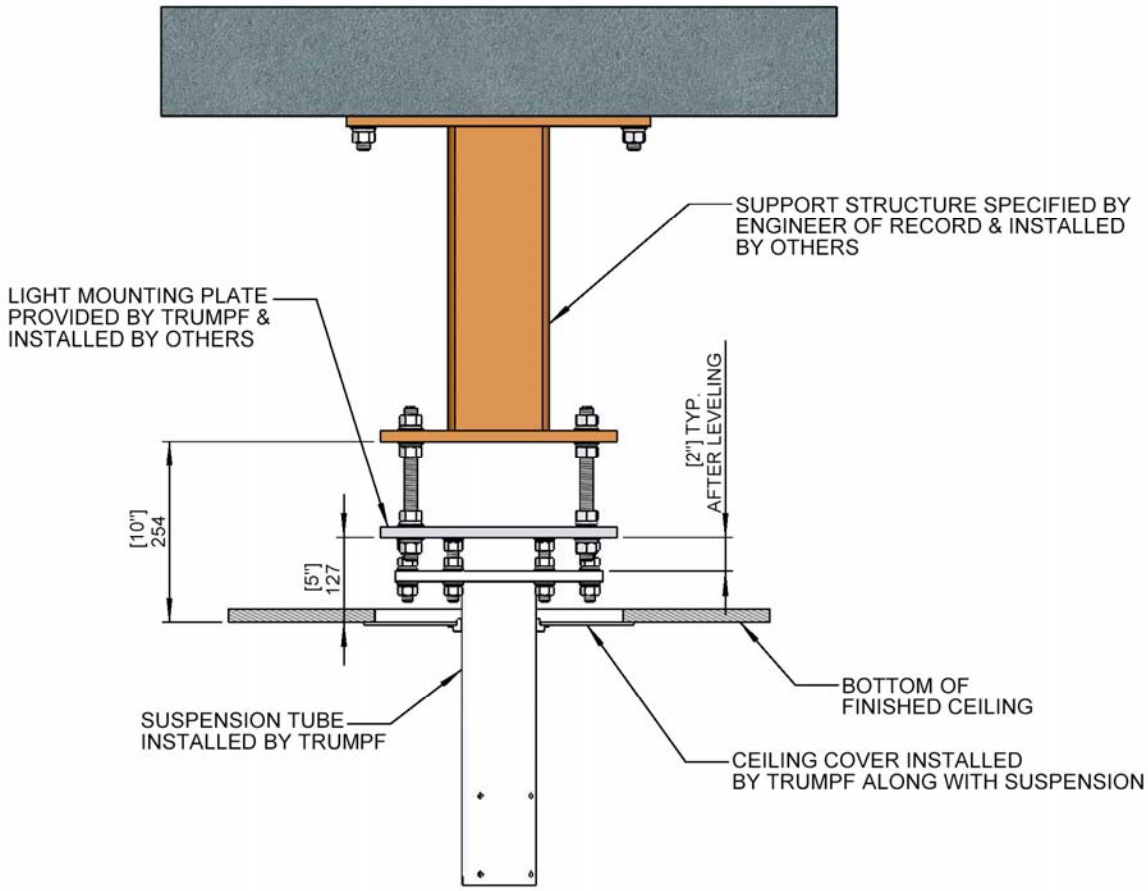


Figure #9) Structural Elevations for Light / Flat Panel with Flat Ceiling Cover

When using the flat ceiling cover, the structure must be designed such that the underside of the TRUMPF light mounting plate will be 5" above the finished ceiling. The support substructure by others should be planned to end at 10" above the finished ceiling.

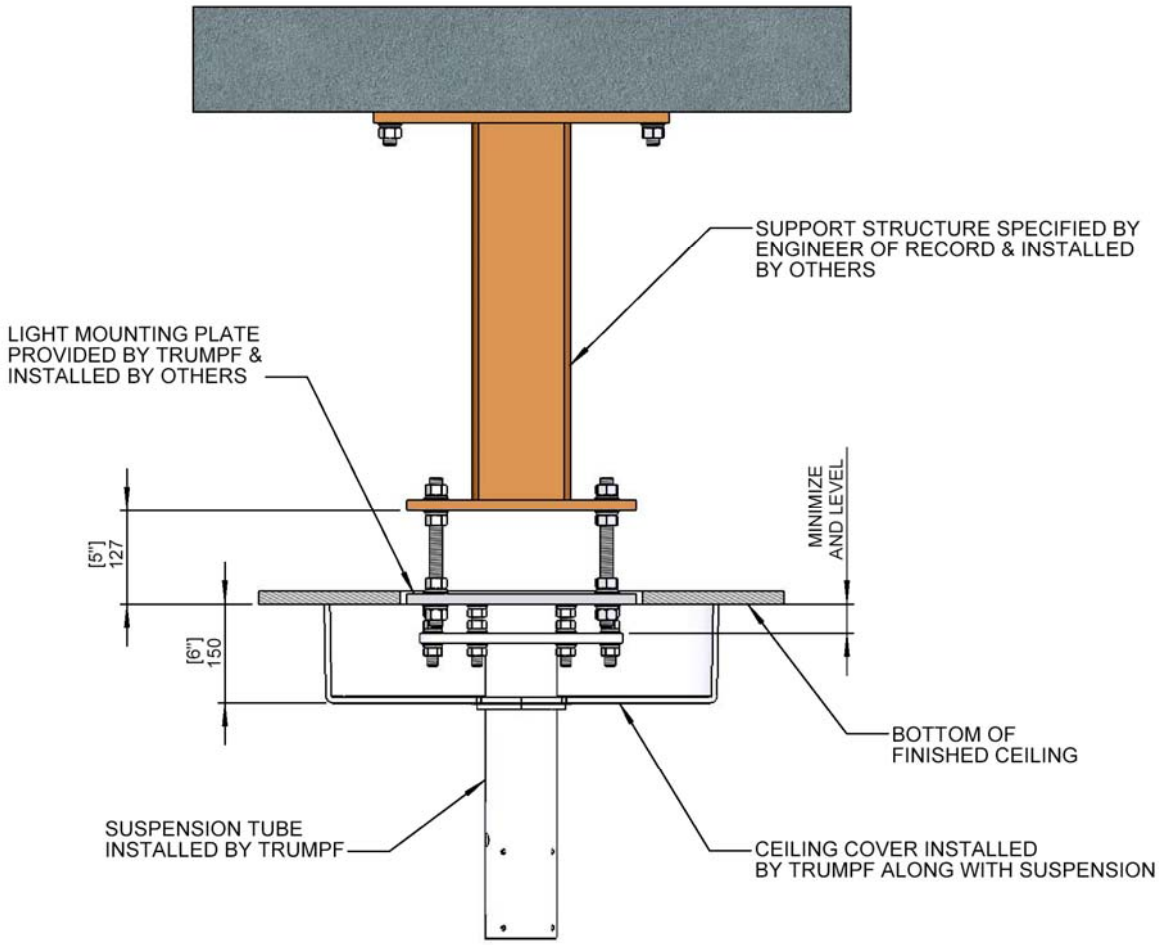


Figure #10) Structural Elevations for Light / Flat Panel with 6" Deep Ceiling Cover

When using the 6" deep ceiling cover, the structure should be designed such that the underside of the TRUMPF light mounting plate will be flush with the room side of the finished ceiling. If possible, the support substructure by others should be planned to end at 5" above the finished ceiling. However, the 6" deep ceiling cover is primarily utilized for renovation scenarios when existing structures are to be reused. When utilizing an existing structure for a replacement light the bolt pattern, and existing structure elevation must be recorded and given to TRUMPF. An adapter mounting plate is available from TRUMPF which allows the TRUMPF suspension tube to adapt to common industry bolt patterns (P/N: 110002).

Note: The structural engineer of record will need to verify that the existing structure is adequate for the TRUMPF design loads and deflection criteria as specified is Sections 3.1 and 3.2.

3.4 TRUMPF Surgical Light / Flat Panel Mounting Plates

TRUMPF will supply a light mounting plate to be installed by the contractor during the pre-installation phase of a project. There are two different versions of the light mounting plate. The standard light mounting plate (P/N: 110036) is used for all new construction projects, and an adapter plate (P/N: 110002) is available for renovations to existing structures. Figure #6 shows a depiction of both plates, and detailed drawings are available upon request.

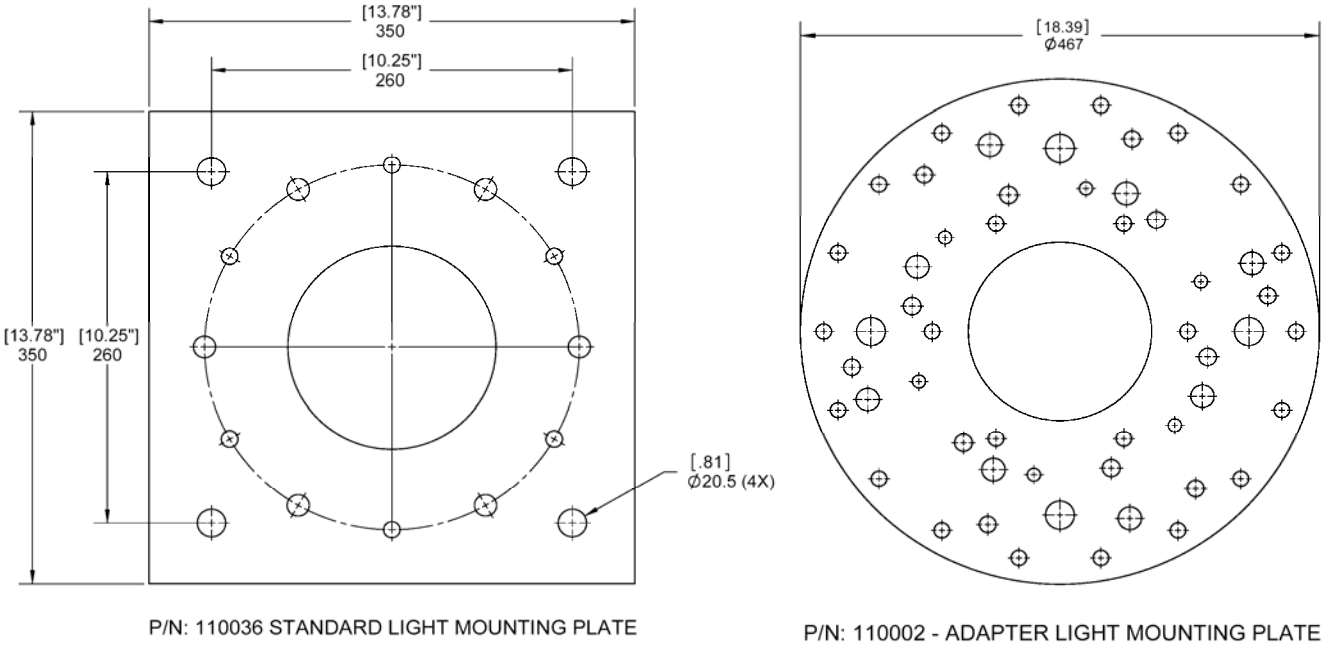


Figure #11) Light Mounting Plates

TRUMPF recommends 3/4" ASTM-A307 hardware for attachment of the TRUMPF light mounting plate to the sub-structure. This hardware specification needs to be approved by the structural engineer of record for the project. Mounting holes for the standard light mounting plate attachment to the sub-structure are on a 10.25" square pattern. The required cutout in the finished ceiling is 14.5" x 14.5" square +/- 1/2".

The Adapter light mounting plate is used to adapt TRUMPF systems to existing installation for renovation projects. Please reference drawing #110002 in the appendix for details regarding the available hole patterns.

3.5 TRUMPF Surgical Light Electrical and Conduit Requirements

3.5.1 Installation of Surgical Light Transformer Enclosures

For new construction projects, the surgical light power transformers will be located in above ceiling enclosure boxes. A separate transformer enclosure is required for each lamp head. Transformer enclosures will be provided by TRUMPF in advance of the final installation. Transformer enclosures must be located in an accessible location. If necessary, an access panel may be required in the finished ceiling for the transformer enclosure(s). Figure #11 shows the overall dimensions of the transformer enclosure; please refer to TRUMPF drawing # 110699 for additional information.

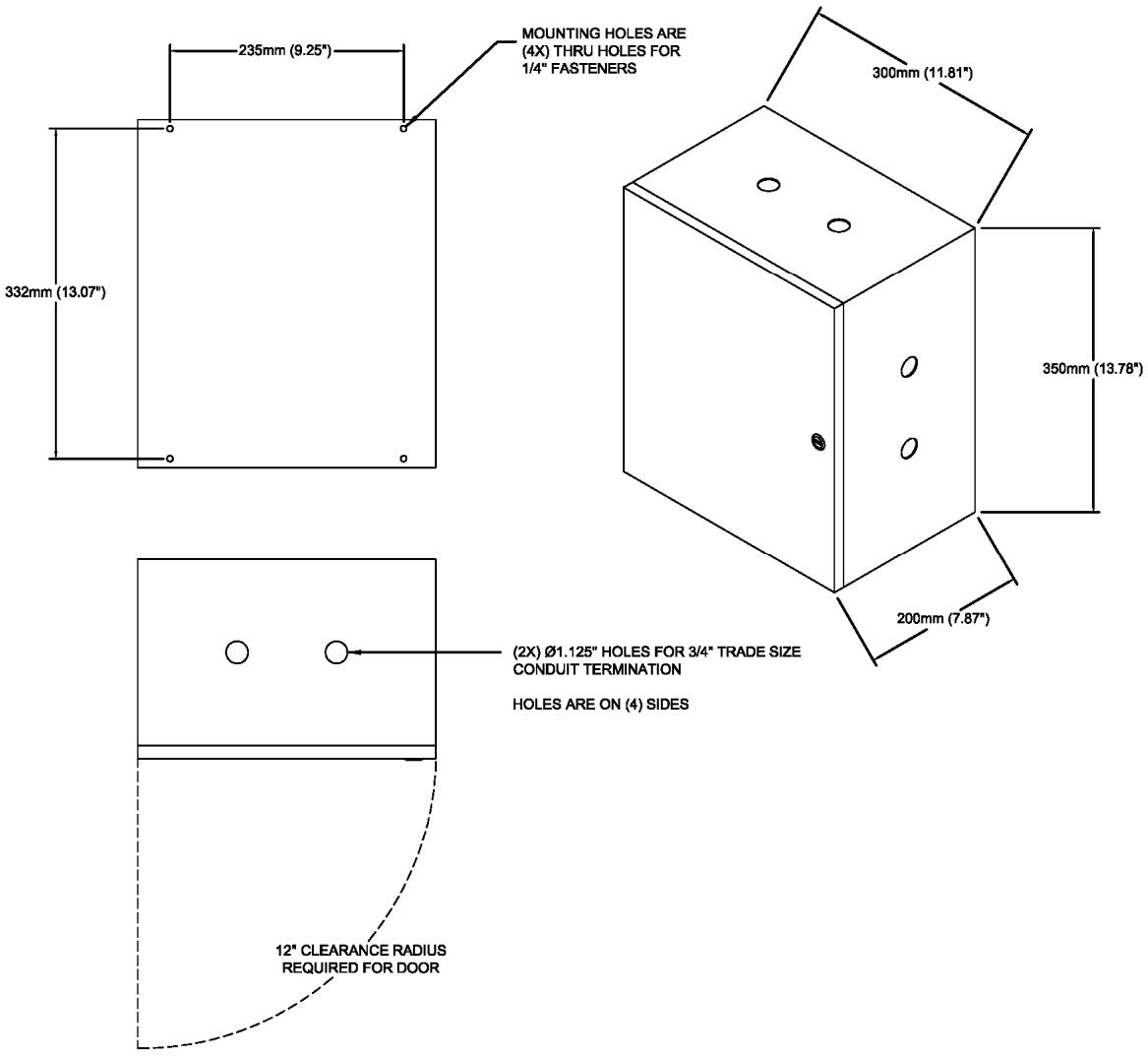


Figure #12) Surgical Light Transformer Enclosure

Notes:

1) Hardware for enclosure mounting is provided by others.

2) Transformer enclosure(s) must be mounted within 30' of the light mount.

3) If possible multiple transformer enclosures should be located adjacent to one another.

4) Refer to Section 3.5.3 for required conduit runs.

3.5.2 Transformer Location for Replacement (Renovation) Lights

In the case of renovation projects it may be difficult to find a suitable location for transformer enclosures. In this situation, it is possible to mount the transformers underneath the ceiling cover on the light suspension tube. The 6" deep round ceiling cover must be used when mounting transformers underneath the ceiling cover, and design elevations must be consistent with Figure #9 in Section 3.3.

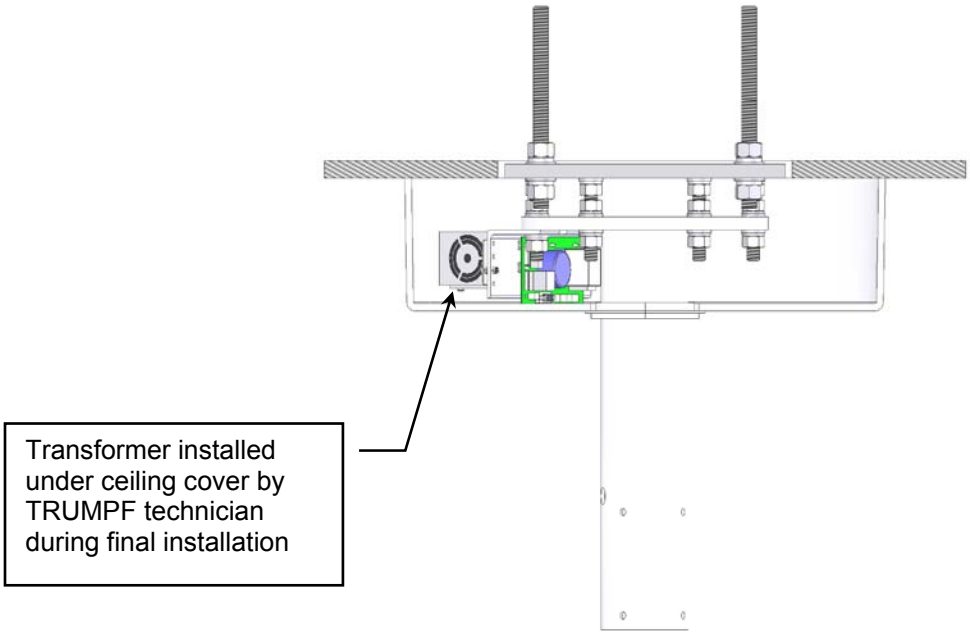


Figure #13) Transformer Installed Underneath Light Ceiling Cover

Note:

1) Refer to Section 3.5.4 for required conduit runs

3.5.3 Required Conduits for Transformers in Enclosures (New Construction)

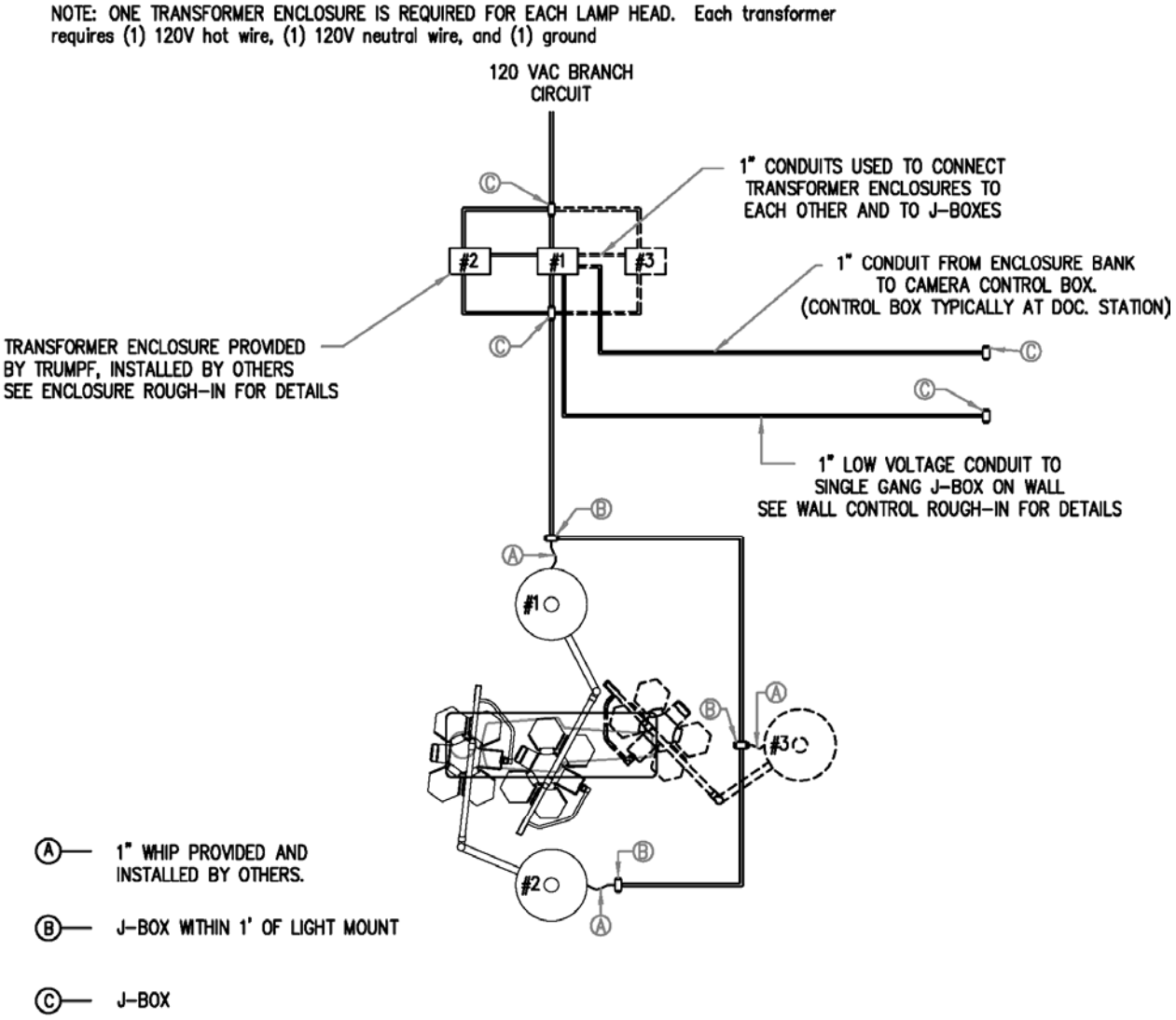


Figure #14) Required Conduit Runs for Transformers in Enclosures

Notes:

1) *Total conduit runs from transformer enclosures to light mounts or wall controls must not exceed 30'.*
2) *All fabricated structures, 120 VAC circuits, conduits, junction boxes, and whips are provided and installed by others.*
3) *Low voltage cables for wall controls, synchronization, and DC power are provided and installed by TRUMPF.*

3.5.4 Required Conduits for Transformers Underneath Cover (Renovation)

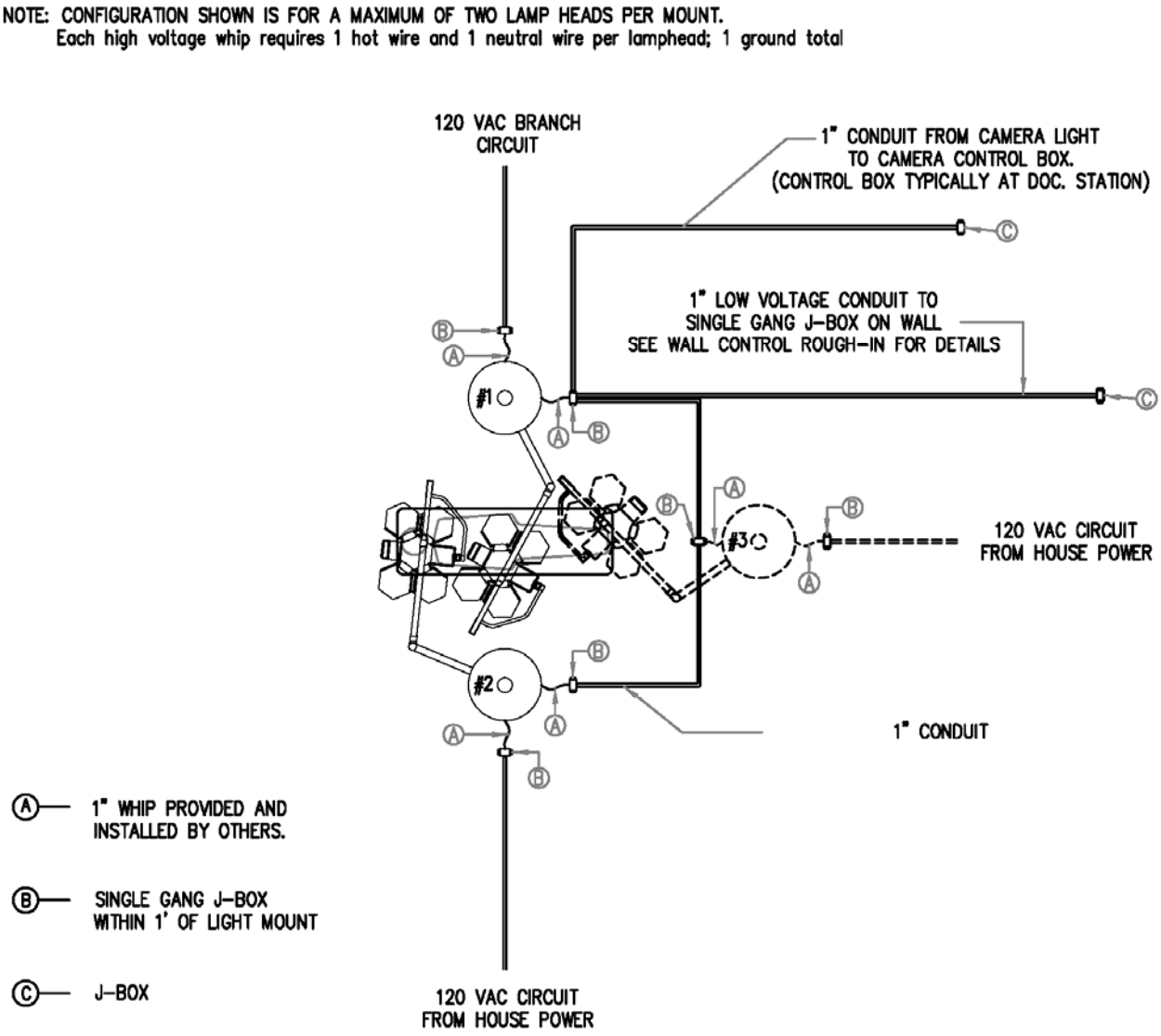


Figure #15) Required Conduit Runs for Transformers Underneath Ceiling Covers

Notes:

1) *Total conduit runs from light mounts to wall controls or camera boxes must not exceed 30'.*
2) *All fabricated structures, 120 VAC circuits, conduits, junction boxes, and whips are provided and installed by others.*
3) *Low voltage cables for wall controls, synchronization, and DC power are provided and installed by TRUMPF.*

3.5.5 Site Preparation for Surgical Light Wall Controls

Wall control boxes for the surgical lights will be installed during the final installation. TRUMPF will supply and pull the low voltage transmission cables. The appropriate on-site contractor will be responsible preparation of the site for the wall control boxes. This includes the rough-in of single gang junction boxes and rigid conduit per figure #16 as shown below. Wall control boxes will be surface mounted using anchors.

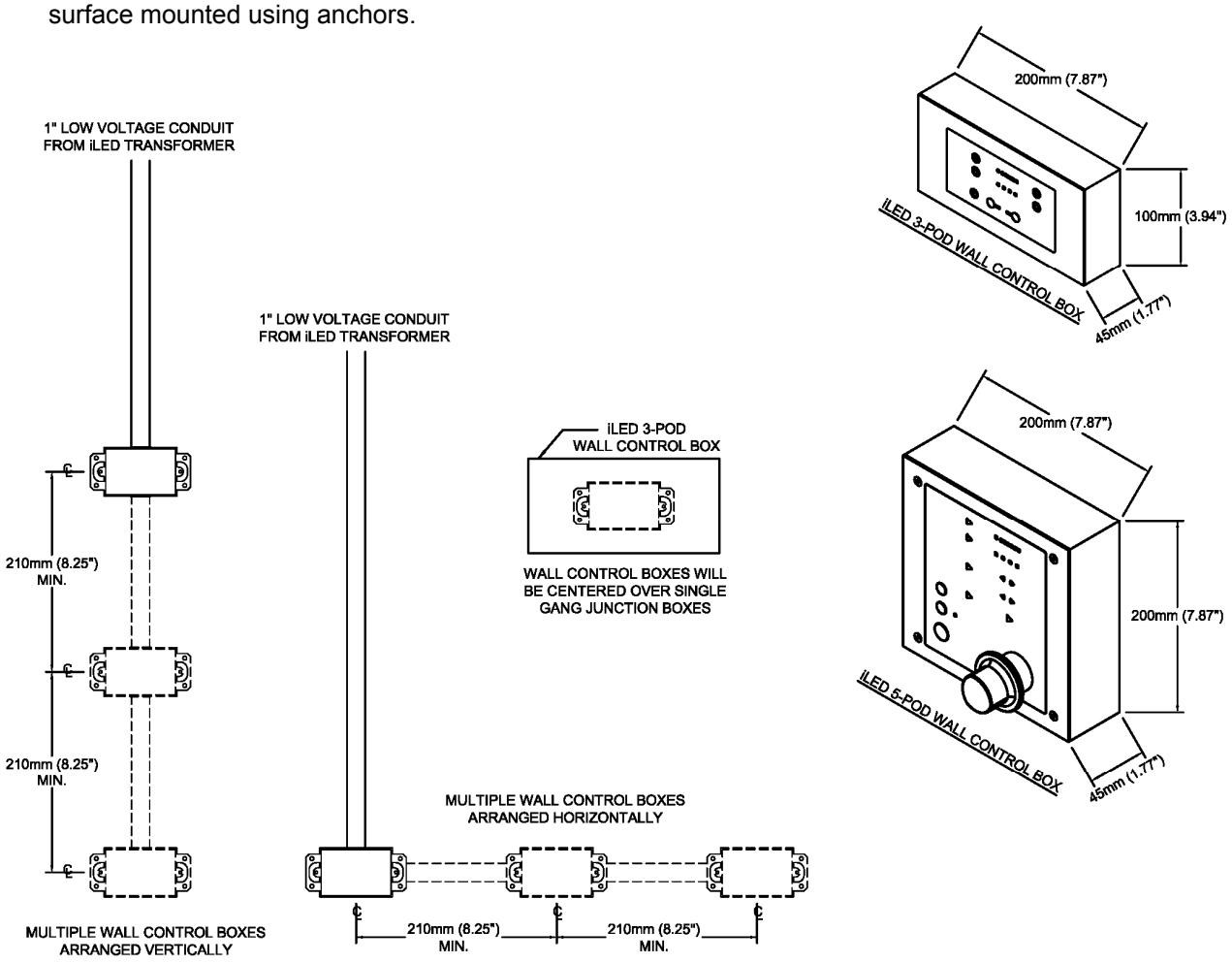


Figure #16) Surgical Light Wall Control Rough-in and Dimensions

Notes:

1) *Contractor is to provide (1) 1" conduit terminating to a single gang junction box for each wall control. Multiple wall controls can be ganged together as shown above.*
2) *Single gang junction boxes should be mounted horizontally.*
3) *Wall control boxes and low voltage signal cables will be provided and installed by TRUMPF during final installation.*
4) *Project architect should determine wall control placement.*

4.0 Ceiling Mounted Exam (Helion-S) Lights

4.1 Design Loads for Ceiling Mounted Exam (Helion-S) Lights

Fmax.	445 N (100 lbf)
Mbmax.	339 Nm (250 ft-lbs)

Figure #17) Design Loads for Exam (Helion-S) Lights

4.2 Structural Deflection Criteria (Helion-S)

- Maximum horizontal deflection of substructure at the attachment point of the TRUMPF mounting plate must not exceed 0.1” when subject to horizontal load of 100lbs.
- Maximum angular deflection of substructure at the attachment point of the TRUMPF mounting plate must not exceed 1/3° from level when subject to the design loads as specified by TRUMPF.

4.3 Design Elevations for Substructure (Helion-S)

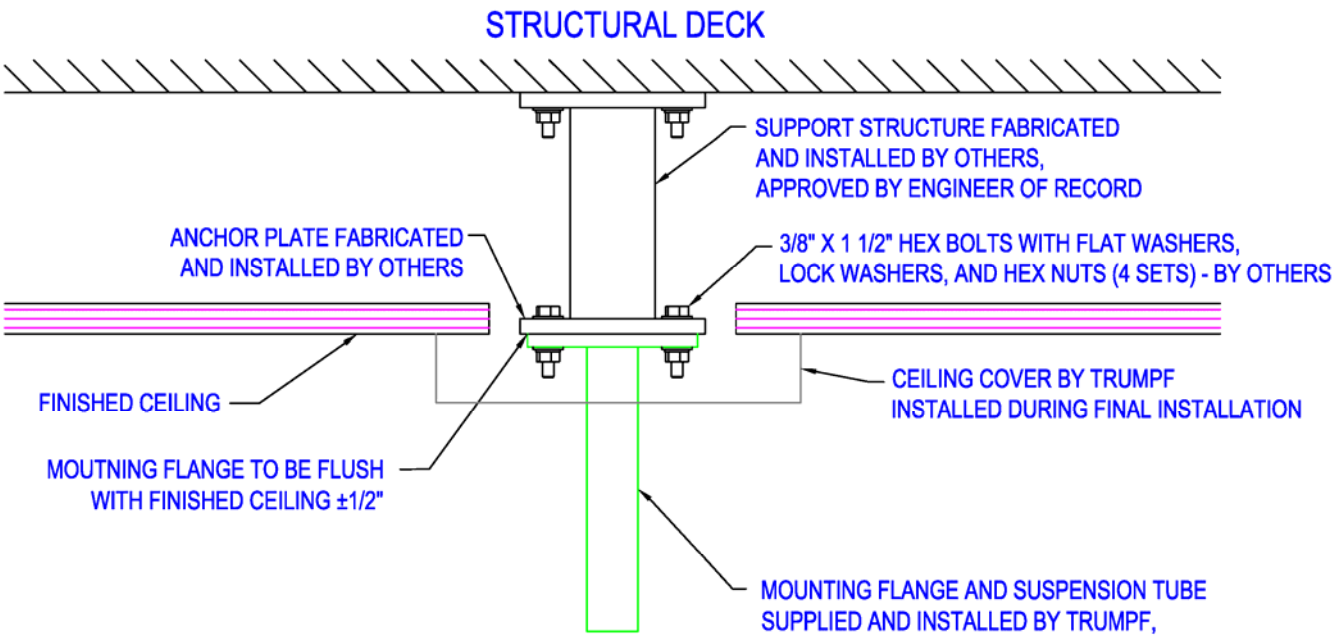


Figure #18) Design Elevations for Helion-S

Notes:

1) Required opening in finished ceiling is 8" x 8" +/- ¼" centered.

2) Four each, 3/8" diameter x 1.5" long hex bolts, hex nuts, flat washers, and split lock washers are required for final installation. Hardware is to be provided by others.

3) Upper flange of suspension tube is 6" square by ½" thick. Mounting holes are located on a 4-3/16" square hole pattern.

4) The sub structure should be designed to come to rest flush with the finished ceiling for all installations with finished ceiling heights in excess of 9' AFF. For finished ceiling heights less than 9' AFF, please contact TRUMPF Project Engineering for recommendations on sub-structure elevations.

4.4 Electrical and Conduit Requirements (Helion-S)

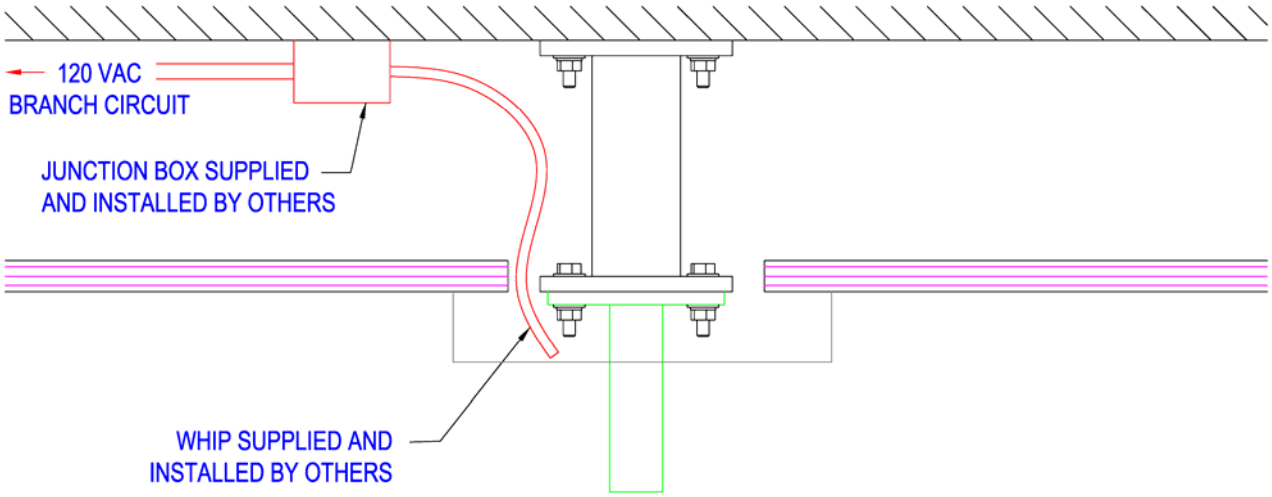


Figure #19) Electrical and Conduit Requirements for Helion-S

Notes:

1) Light transformer is mounted on the suspension flange and is covered by a 12" diameter x 4" deep soffit. Transformer is installed by TRUMPF during final installation.

2) One 120 VAC branch circuit, junction box, and whip are to be supplied by others. Junction box should be located within 1' of light mount, and whip must reach a minimum of 2" below the finished ceiling.

3) Power control switch is located on lamp head.

A.0 Appendix

A.1 Rough-in Drawings Available Upon Request

The following matrix lists the applicable product and rough-in drawings for each phase of a pre-installation project. Please call out the drawing number and revision level when referencing these files in top level plans or process discussions.

Pre-installation Process	Equipment Management Systems (EMS)	iLED Surgical Light and Flat Panel Suspensions	Helion-S Ceiling Mounted Examination Light
Mounting System Elevations and Bill of Materials	110106 – 8" Span 110107 – 14" – 47" Span 110108 – 47" – 59" Span	110433	110687
Mounting Plates	110037 – Mounting 110213 – Lateral Bracing	110036 –Standard 110002 – Adapter	N/A
Transformer Enclosures	N/A	110699	110687
Required Conduit Pathways	By Integration Provider	110694 110695 110696 110697 110698	110687
Wall Controls	N/A	110701	N/A

Figure #20) Rough-in Drawings from TRUMPF

A.2 Contact Information

TRUMPF Project Engineering can be reached for further clarification at (888) 474-9460