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This Pre-Installation Guide describes the requirements for assembling and installing components used in the support of Stryker ceiling-mounted surgical lighting and monitor carrying assemblies prior to installation. This guide covers all mechanical and electrical pre-installation requirements for the lights, control panel, and power supply. This guide does not describe the installation of the surgical monitors or support arm assemblies.
Read this guide and follow its instructions carefully. The words WARNING, CAUTION, and Note carry special meaning and should be carefully reviewed:

**WARNING**  A warning indicates that the personal safety of the patient or physician may be involved. Disregarding this information could result in injury to the patient or physician.

**Caution**  A caution indicates that there is risk of damaging the instrument.

**WARNING**  A warning with a lightning bolt warns of hazardous voltage. All service must be performed by authorized personnel.

**Note**  A note provides additional information, which may be useful but is not essential to complete the procedure.

To avoid serious injury to the user, patient, and/or damage to this device, adhere to the following warnings:

- Use caution when lifting heavy objects to avoid serious bodily injury or damage to equipment.

- Energized electrical circuits can cause severe injury or death. Ensure that all personnel working around energized circuits have been trained in and follow proper lock-out/tag-out and other applicable safety procedures.

- All Stryker-supplied equipment should be stored in a clean, dry environment prior to installation. Failing to comply with this requirement may lead to equipment damage and possible failure of life support components.
Symbols

Denotes oxygen explosion - Oxygen forms explosive mixtures with oils, greases, and lubricants. Compressed oxygen presents an explosion hazard. Keep oxygen and gas outlets free from substances that contain oil, grease, or lubricants.

Denotes compliance to CSA Standard C22.2, 60601.1 - M90

Denotes compliance to CSA Standard C22.2, 60601.1 - M90, AS 3200, IEC 60601, IEC 60601-2-41

Denotes hot surfaces

Denotes compliance to European Community Directive 93/42/EEC.

Denotes temperature limits for indicated operation or storage.

Provides usage tips and useful information

Denotes electric shock hazard

Denotes humidity limits for indicated operation or storage.

Terms

- Interstitial Space The area between solid ceiling and finished ceiling.
- HTM2007 Design considerations and Validation of Electrical Services
- HBN 26 Guidelines for the design of Facilities for Surgical Procedures
- HTM2022 Sign, installation, validation, and verification of Medical Gas Pipeline Systems
- IEC60601 Medical Electrical Equipment - General requirements for safety
- IEC364 Electrical Installations of Buildings: section 710 Medical Locations
- NEC National Electrical Code
- NFPA National Fire Protection Agency (see http://www.nfpa.org)
- NFPA 99 Section of NFPA relating to Health Care Facilities
- OSHPD Office of Statewide Health Planning and Development (California) (see http://www.oshpd.ca.gov)
Guidelines and Responsibilities

Hospital/Contractor Responsibility

Super Structure/Mounting Support

**WARNING**
Responsibility for proper design of the support structure lies entirely with the hospital/contractor and is not covered through warranty by Stryker. An improperly designed support structure may result in poor performance or damage to equipment and possible injury to the user. Service charges related to inadequate support structure design is at the customer’s expense.

Stryker will not review or approve customer support structures. This is the responsibility of the customer's architect and designated structural engineer. Any visit by Stryker personnel to view the steelwork is only to compare its position to ceiling plans.

1. Design and install the support structure to:
   - Support (Stryker-supplied) weight and moment loads of each equipment piece.
   - Satisfy all applicable regulations including, but not limited to, building and electrical codes.

2. Install the Stryker-supplied Mounting (Interface) Plate at the bottom of each support structure in accordance with the recommended method.

3. Loosely install (Stryker-supplied 5/8-11 UNC, M16 if provided) all thread, nuts and washers into the six (6) holes of the Mounting (Interface) Plate to avoid loss of hardware prior to installation.

4. Ensure that Stryker equipment and infrastructure is not impeded by the design of the support structure.

5. Verify that the diameter of the mounting site is 21in-22in to install the LED Surgical Light System.

6. Install access panels directly adjacent to each mounting point for future access for service and maintenance as described in this manual.

Delivery and Storage

1. Accept delivery of Stryker crates and equipment to the proper room prior to the installation date.
   All Stryker-supplied equipment should be stored in a clean, dry environment prior to installation. Failing to comply with this requirement may lead to damage of equipment and possible failure of life support components.

2. Remove and dispose of the pallets and boxes after completing the installation.
Drawings and Information

- The hospital must supply Stryker with up-to-date drawings in .dwg format (CAD) including but not limited to:
  a. Room layout plans (current and proposed)
  b. Electrical services drawings
  c. Mechanical services drawings
  d. Elevation drawings
  e. Structural steel (support structure) drawings
  f. Ceiling drawings
- The hospital must ensure that Stryker is notified of all revisions and changes to drawings prior to and during the scope of the project.

Electrical and Data Infrastructure

1. Install the Mains power, junction boxes, Ethernet drops and grounded power outlets as described in this manual, CAD drawings and applicable regulations and standards.
2. Provide an uninterruptible, grounded and isolated power to the surgical light system.
3. Install the appropriate conduit, catenaries and cable trays between mains power, surgical light power supply box, wall control panel and the support structure mounting points.
   - **For Visum LED Lights:** Install the back box for the wall-mounted Visum LED Surgical Lights application.
4. Provide access for all Stryker personnel to route Stryker-supplied cables from locations within each room to the termination locations, as specified in the CAD drawings.
5. Verify the capacity of electrical infrastructure is capable of meeting the requirements as specified by Stryker for the project.
6. Perform final electrical testing and validation for all electrical cables and power outlets, including those on Stryker-supplied booms.

**Note**
Flat Panel Only: Optional 5A in-line fuses are provided and may be installed by the electrical contractor when the flat panel power is connected to the house power.
Stryker’s Responsibilities

- Provide the hospital or designated contractor with CAD drawings including elevation and room configuration drawings for Stryker-supplied equipment.
- Advise the hospital of a proposed time-frame for installation of Stryker-supplied infrastructure.
- Check in with hospital personnel and/or contractor to announce arrival.
- Install the surgical lights and calibrate the brakes according to Stryker specifications.
- Connect low voltage electrical and data cables for surgical lights and adjust lighting (voltage, field diameter adjustments, etc.) to Stryker specifications.
- Install the flat panel monitor arm (if applicable) and calibrate the brakes to Stryker specifications.
- Route and terminate all audio visual cables required for Stryker-supplied equipment.
- Install flat panel monitor (if applicable) and connect audio visual wiring kit to the flat panel.
Mounting Plate Descriptions

Mounting (Interface) Plate

The Mounting Plate is the primary mounting component for new surgical light installations. The plate must be welded or bolted to the support structure by the hospital/contractor.

![Figure 1: Stryker-supplied Mounting (Interface) Plate](image)

**WARNING**  The mounting plate is part of the support structure. It is the hospital’s responsibility to ensure that the mounting plate can sufficiently support the loads defined for the support structure.

**Note**  Ensure that the area inside the Clear Zone and at least one of the 2X M6 holes remain unobstructed by the support structure or weld slug.
Universal Mounting Plate

The Universal Mounting Plate adapts the hole-pattern of existing ceiling plates to accommodate Stryker equipment. At least one hole pattern in the existing mounting plate must align with one hole pattern in the Universal Mounting Plate.

For all references in this guide, the Universal Mounting Plate only adapts Stryker equipment to existing mounting plates supplied by Steris®, Berchtold® or Getinge. It is the hospital’s responsibility to determine whether their existing plate is compatible with the Universal Mounting Plate prior to site preparation.

**WARNING** The existing mounting plate is part of the support structure. It is the hospital’s responsibility to ensure that the existing plate is sufficiently strong to support the loads defined in this manual.

![Figure 2: Mounting & Universal Plate Diagram](image)

![Figure 3: Universal Mounting Plate](image)
Visum 450 & 600 (Halogen) Light Power Supply Box

(Weight: 36.5 lbs/16.5 kg)

1. The power supply box provides 24 VDC power to the surgical lights from a 120/230 VAC source.

2. Mount the power supply box at the documentation station.

Note: Single and dual-light configurations require one power supply box. Three or four-light configurations require two power supply boxes.

3. Use a Three-Bay Documentation Station to accommodate the power supply box and a SwitchPoint™ unit.

Note: The power supply box can be configured with an optimal 24V inlet for battery backup, if required by the hospital.

Front View of Power Supply Box

Back View of Power Supply Box

Figure 4: Power Supply Box
Visum 450 & Visum 600 (Halogen) Light and Camera Wall Control Panel

The wall control panel provides control for lighting levels as well as control for cameras where applicable.

1. Vertically mount the wall control panel at conventional light switch height.

   **Note** Single and dual-light configurations require one power supply box. Three or four-light configurations require two power supply boxes.

2. Attach the wall control panel to the three-gang box (use the provided screws).

**Figure 5: Wall Control Panel**

   **Note** It is not required to install the wall control panel inside the documentation station. Consult the hospital to determine ideal placement near or in the documentation station. For proper installation of the wall control panel, a standard RACO 942 three-gang box should be mounted vertically.
Visum LED Part Descriptions

Power Supply Box for Visum LED

(Weight: 20lbs/9.09 kg)

The power supply box provides 24 VDC power to the surgical lights from a 120/240 VAC source.

1. Mount the power supply box at the documentation station or near a power outlet and Ethernet drop.
   Consider spacing on the floor, away from walking traffic, to accommodate the power supply box.

   **Note**  Single and dual-light configurations require one power supply box. Three or four-light configurations require two power supply boxes.

2. Use a Three-Bay Documentation Station to accommodate a power supply box and a SwitchPoint™ unit.

![Diagram of Power Supply Box & Ports]

*Figure 6: Power Supply Box & Ports (for Visum LED Surgical Lights)*
Power Supply Box Wall Mount (Optional)

The Power Supply Box Wall Mount should be used to securely install and mount a Visum LED power supply box to a wall.

*The Back Box is concealed within the wall.

*Figure 7: Exploded/Side view of Power Supply Box*

**Note** Mount a standard Hubbell Wiegmann (P/N SC101004) junction box for proper installation of a wall-mounted power supply box. Consult the hospital to determine ideal placement for the power supply box.
Visum LED Wall Control Panel

The Visum LED Wall Control Panel enables users to control light intensity as well as camera functions.

Vertically mount the panel at conventional light switch height. The wall control panel comes with four screws to attach the panel to a three-gang box.

Note: Single and dual-light configurations require one power supply box. Three or four-light configurations require two power supply boxes.

Figure 8: Wall Control Panel
Installation of the support structure (as outlined in the Guidelines and Responsibilities section of this guide), electrical conduits, junctions boxes, video, data, and other services should be installed by the hospital or contractor and are not contained within the scope of work for Stryker. Stryker assumes all work has been performed in accordance with all applicable engineering and electrical building codes.

**Support Structure**

1. Position the support structure according to the room layout provided by Stryker.

   ![WARNING] The maximum allowed deflection of the ceiling plate under maximum load is 1° (1/360 deflection ratio).

   ![Note] The support structure must adequately support the loads specified for each application. Structure designs can vary significantly based on load, interstitial space, obstructions, and building codes.

2. Weld the Mounting (Interface) Plate to the support structure along the outer edge of the plate or use the six (.83in) holes along the outer edge of the plate to bolt it to the support structure (see Figure 1).

   Do not use Stryker-supplied thread-all rods to attach the suspension to the Mounting (Interface) Plate. The bolts must be supplied by the contractor.

   The Mounting (Interface) Plate must be level within 0.25in (6.4mm). The bottom of the mounting plate must be 2in-4in (50mm-100mm) above the finished ceiling. The space allows cables and hoses to be routed from the surgical light and Flat Panel Arm.

   ![WARNING] Caution must be exercised when lifting heavy objects to avoid serious bodily injury or damage to equipment.

   ![Note] Dynamic (seismic) loads per California Building Code 1632A are available in Appendices A and B.
**WARNING**  Proper design and manufacture of the support structure is the hospital and contractor’s responsibility and is not covered through warranty by Stryker. Insufficient structure support may result in poor performance or damage to equipment as well as injury to the user. Service charges related to inadequate structure support are the hospital’s responsibility.

**WARNING**  The mounting plate is part of the support structure. It is the hospital’s responsibility to ensure that the mounting plate is sufficiently supported to carry the loads defined for the support structure.

**Note**  The support structure must be designed and installed to avoid obstruction of or interference with the six tapped holes [5/8-11 UNC (M16)] located adjacent to the inner diameter of the Mounting (Interface) Plate as well as the 9.06in (230mm) diameter center hole.

**Note**  “Bolt-together,” prefabricated, structural members are highly discouraged and considered an unacceptable solution for the support structure design. This approach generally allows considerable flexing of the structure resulting in poor performance and possible equipment damage.

Ceiling access

- An 18in x 18in (450mm x 450mm) minimum access panel must be installed in the ceiling within 18in (450mm) of the Mounting (Interface) Plate to allow connection of electrical and data cables during final installation.

- An 21in-22in (533mm-558mm) hole, either circular or square, concentric with the Mounting (Interface) Plate center is required for the light assembly installation. A 24in (600mm) diameter ceiling cover (Stryker-supplied) will conceal the hole after the suspension has been completely installed.
**Electrical Installation**

**WARNING** Energized electrical circuits can cause severe injury or death. Ensure that all personnel working around energized circuits have been trained in and follow proper lock out/tag out and other applicable safety procedures.

**Note** Electrical installation and components must conform to all applicable regulations.

**Note** All contractor-provided components must be UL-approved or UL-recognized.

**Note** Maximum cable lengths specified in Conduit Schedules (Figures 10, 11 and 12) indicate the maximum length of cables routed through conduits. Ensure that the cable distance between the components (e.g., suspension and power supply box) does not exceed the specified lengths.

**Power Supply Box Mounted in Documentation Station**

1. Install a vertically-mounted, three-gang junction box (e.g., RACO 942) for each wall control panel.

**Note** One and two-light configurations require one junction box; three and four-light configurations require two junction boxes.

**Note** It is not necessary to install the wall control panel inside the documentation station. Consult the hospital to determine ideal placement near or in the documentation station for the wall control panel.

2. Install an 18in x 18in (45cm x 45cm) back box behind the documentation station where the power supply box will be located.

3. (Visum LED only) Verify that an Ethernet drop is available within 72in (1.8m) of the power supply box.

4. Verify that a grounded, uninterruptible and isolated power outlet (110V/220V) is available within 48in (1.2m) of each power supply box.

5. Install conduits as specified in Figure 10.

6. Provide pull-strings and terminate all conduits with bushings.

**Note** All components must be located so that conduits do not exceed the maximum lengths specified in Figure 10.

**Note** Suspensions with flat panel monitors require additional electrical components (see Suspensions with Flat Panel Arms).
Figure 10: Electrical Installation with Power Supply Box & Documentation Station

- **A** Suspension
- **B** RACO 942 TRIPLE GANG JUNCTION BOX
- **C** 18" X 18" BACK BOX
- **D** ETHERNET DROP (FOR VISUM LED ONLY)
- **E** 110/220V UNINTERRUPTABLE, GROUNDED, ISOLATED HOSPITAL POWER

**Conduit Schedule**

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
<th>Size</th>
<th>Maximum Cable Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-C</td>
<td>1</td>
<td>2&quot; (51mm)</td>
<td>75' (22m) 75' (22m)</td>
</tr>
<tr>
<td>B-C</td>
<td>1</td>
<td>1&quot; (25mm)</td>
<td>15' (4.5m) 75' (22m)</td>
</tr>
</tbody>
</table>

**NOT TO SCALE**

---

Site Preparation

---
Wall-Mounted Power Supply Box (Visum LED only)

1. Install an 18in x 18in (45cm x 45cm) back box behind the documentation station, if applicable.

2. Install a 10in x 10in x 4in Hubbell Wiegmann (P/N SC101004) junction box at the location of the power supply box.

   **Note**  The wall control panel is mounted on the power supply box for wall-mounted applications.

3. Provide 110V/200V, uninterruptible, grounded and isolated power to the 10in x 10in junction box.

   **Note**  The hospital must appoint an electrician to connect the power supply box to the house power.

4. *(Visum LED only)* Verify that an Ethernet drop is available within 72in (1.8m) of the documentation station.

5. Install the conduits as specified in Figure 11.

6. Provide pull-strings and terminate all conduits with bushings.

   **Note**  All components must be located so that conduits do not exceed the maximum lengths specified in Figure 11.

   **Note**  Suspensions with flat panel monitors require additional electrical components (see Suspensions with Flat Panel Arms).
Figure 11: Electrical Installation with Wall-Mounted Power Supply Box & Documentation Station
Suspensions with Flat-Panel Arms

For each suspension with a flat panel monitor:

1. Install an additional 2in (50mm) conduit between the suspension and the documentation station (see Figure 12).

2. Provide pull-strings and terminate all conduits with bushings.

3. Install a junction box with 110/220V uninterruptible power within 12in (30cm) of the mounting plate.

Note: If required, provide optional 5A in-line fuses for connection of a flat panel monitor to the Mains power. An electrical contractor must install the fuses.
Figure 12: Electrical Installation with Flat Panel & Documentation Station

- **A** Suspension
- **B** RACO 942 Triple Gang Junction Box
- **C** 110/220V Uninterruptable, Grounded, Isolated Hospital Power
- **D** 18" X 18" Back Box
- **E** Ethernet Drop (For Visum LED Only)
- **F** 2" X 4" Junction Box

**Conduit Schedule**

<table>
<thead>
<tr>
<th>Item #</th>
<th>QTY</th>
<th>Size</th>
<th>Visum Halogen</th>
<th>Visum LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-D</td>
<td>2</td>
<td>2&quot; (51mm)</td>
<td>75' (22m)</td>
<td>75' (22m)</td>
</tr>
<tr>
<td>B-D</td>
<td>1</td>
<td>1&quot; (25mm)</td>
<td>15' (4.5m)</td>
<td>75' (22m)</td>
</tr>
<tr>
<td>C1-F</td>
<td>1</td>
<td>1&quot; (25mm)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Not to Scale**
Figure Explanation: Two power supply boxes are mounted in the documentation station. One additional conduit is required for the flat panel suspension and two vertically-mounted junction boxes are required for two wall control panels.
Specifications

Environmental Specifications

<table>
<thead>
<tr>
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<th>Range</th>
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<tr>
<td>Operating Humidity</td>
<td>10%–95%</td>
</tr>
<tr>
<td>Storage Humidity</td>
<td>10%–95%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating Temperature</th>
<th>Visum LED Surgical Light/StrykeCam 2</th>
<th>41–100 °F (5-38 °C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Temperature</td>
<td>Visum LED Surgical Light/StrykeCam 2</td>
<td></td>
</tr>
<tr>
<td>Pressure</td>
<td>Visum LED Surgical Light/StrykeCam 2</td>
<td>21-31 in. Hg (71kPa-105kPa)</td>
</tr>
</tbody>
</table>

Electrical Specifications

<table>
<thead>
<tr>
<th>Rated Input</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>115-230 V~50/60 Hz</td>
</tr>
<tr>
<td>Current</td>
<td>4.5 A</td>
</tr>
<tr>
<td>Power per Light Head (Visum LED) With Camera</td>
<td>443.59 Btu/hr (130 W)</td>
</tr>
<tr>
<td>Without Camera</td>
<td>429.93 Btu/hr (126 W)</td>
</tr>
<tr>
<td>Visum 450 (Halogen) With Camera</td>
<td>511.82 Btu/hr (150 W)</td>
</tr>
<tr>
<td>Without Camera</td>
<td>409.46 Btu/hr (120 W)</td>
</tr>
<tr>
<td>Visum 600 (Halogen) With Camera</td>
<td>614.19 Btu (180 W)</td>
</tr>
<tr>
<td>Without Camera</td>
<td>511.82 Btu/hr (150 W)</td>
</tr>
</tbody>
</table>

Mechanical Specifications

| Max Load Capacity of Light Spring Arm   | 46.2 lbs (21kg) |

Critical Distances

- The bottom of the mounting plate must be within 2in-4in (50mm-100mm) above the finished ceiling.
- The Ethernet drop must be within 72in (1.8m) of the power supply box.
- The wall control panel must be within 60ft (18.3m) of the power supply box.
- If two wall control panels are used, each control panel should be installed on an 8in-10in (203mm-254mm) center.
- If two power supply boxes are used, each power supply box should be installed on a 14in-18in (356mm-457mm) center.
## Support Structure Loads

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Suspension</th>
<th>Weight</th>
<th>$\bar{x}$</th>
<th>$\bar{y}$</th>
</tr>
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<tbody>
<tr>
<td><strong>Halogen</strong></td>
<td>Single</td>
<td>113 lbs (51 kg)</td>
<td>37 in (940 mm)</td>
<td>40 in (1016 mm)</td>
</tr>
<tr>
<td></td>
<td>Dual</td>
<td>179 lbs (81 kg)</td>
<td>38 in (965 mm)</td>
<td>40 in (1016 mm)</td>
</tr>
<tr>
<td></td>
<td>Triple</td>
<td>246 lbs (112 kg)</td>
<td>39 in (991 mm)</td>
<td>40 in (1016 mm)</td>
</tr>
<tr>
<td><strong>LED</strong></td>
<td>Single</td>
<td>131 lbs (59 kg)</td>
<td>30.1 in (765 mm)</td>
<td>53 in (1346 mm)</td>
</tr>
<tr>
<td></td>
<td>Dual</td>
<td>204 lbs (93 kg)</td>
<td>40.2 in (1021 mm)</td>
<td>61.6 in (1564 mm)</td>
</tr>
<tr>
<td></td>
<td>Triple</td>
<td>282 lbs (128 kg)</td>
<td>45.6 in (1158 mm)</td>
<td>65.4 in (1661 mm)</td>
</tr>
<tr>
<td><strong>Flat Panel Arm</strong></td>
<td></td>
<td>214 lbs (97 kg)</td>
<td>33 in (838 mm)</td>
<td>49 in (1245 mm)</td>
</tr>
</tbody>
</table>

*Figure 14: Horizontal ($\bar{x}$) & Vertical ($\bar{y}$) Locations of Center Mass*
Light Suspension Specifications
(Visum LED only)

<table>
<thead>
<tr>
<th>Suspension Capacity</th>
<th>Extension Arm Lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Visum LED</td>
</tr>
<tr>
<td>Single</td>
<td>31.5 in (800 mm)</td>
</tr>
<tr>
<td>Dual</td>
<td>31.5 in (800 mm)</td>
</tr>
<tr>
<td></td>
<td>36.4 in (925 mm)</td>
</tr>
<tr>
<td>Triple</td>
<td>31.5 in (800 mm)</td>
</tr>
<tr>
<td></td>
<td>36.4 in (925 mm)</td>
</tr>
<tr>
<td></td>
<td>41.3 in (1050 mm)</td>
</tr>
</tbody>
</table>
Appendix A: Seismic Calculations (Halogen Surgical Lights)

EASE
EQUIPMENT ANCHORAGE & SEISMIC ENGINEERING
WWW.EQUIPMENTANCHORAGE.COM

STRYKER COMMUNICATIONS

SINGLE ARM SURGICAL LIGHT

SEISMIC ANCHORAGE

CEILING MOUNTED

SUPPORT STRUCTURE
FRAME & BRACING
(BY ENGINEER OF RECORD)

FINISHED
CEILING

USE 6-1/2" AST2
THREADED RODS
FROM FLANGE PLATE
TO INTERFACE PLATE
(BOLT GROUP 'A')

USE 6-1/2" AST2
THREADED RODS
FROM INTERFACE PLATE
TO SUPPORT STRUCTURE
(BOLT GROUP 'B')

BOLT GROUP 'A'

T = 659 LBS/BOLT (2816 N/BOLT)
V = 141 LBS/BOLT (621 N/BOLT)

BOLT GROUP 'B'

T = 516 LBS/BOLT (1813 N/BOLT)
V = 84 LBS/BOLT (364 N/BOLT)

ELEVATION

C.G. HT. =

12 " (305 mm)

NOTES:

1. FORCES ARE DETERMINED PER 2001 CALIFORNIA BUILDING CODE - SECTION 1620A
   AND HAVE BEEN FACTORED TO REPRESENT WORKING DESIGN LOADS, NOT ULTIMATE
   HORIZONTAL FORCE (V_H) = 0.94V_H
   VERTICAL FORCE (V_V) = 0.38V_H

2. CENTER OF GRAVITY (C.G.) HEIGHT IS A MAXIMUM. THIS CALCULATION
   ENCOMPASSES ALL HEIGHTS UP TO THE MAXIMUM HEIGHT SHOWN.

3. ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT
   STRUCTURE DESIGNED TO SUPPORT HEIGHTS AND FORCES SHOWN.
LOADS:
HEIGHT = 115 LBS (509 N)
HORIZONTAL FORCE ($V_h$) = 105 LBS (472 N)
VERTICAL FORCE ($V_v$) = 95 LBS (436 N)

BOLT GROUP PROPERTIES:

\[
\begin{align*}
  l_x \times l_x &= 85 \text{ in.}^2/\text{BOLT} \\
  l_x \times l_z &= 85 \text{ in.}^2/\text{BOLT} \\
  l_y \times l_y &= 164 \text{ in.}^2/\text{BOLT}
\end{align*}
\]

MOMENTS:

\[
\begin{align*}
  M_{XX} &= 1064 \times 40' + 113 + 35' \times 37' = 9.716' \times 10^{3} \text{ N-m} \\
  M_{ZZ} &= 1064 \times 40' + 113 + 35' \times 37' = 9.716' \times 10^{3} \text{ N-m} \\
  M_{YY} &= 1064 \times 59' = 5.922' \times 10^{4} \text{ N-m}
\end{align*}
\]

BOLT FORCES:

TENSION ($T$)

\[
T = \frac{9.716' \times 10^{3} \times 5.52'}{85} + \frac{113 + 35'}{6} = 633 \text{ LBS/BOLT (MAX) (2816 N/BOLT)}
\]

SHEAR ($V$)

\[
V = \frac{1064}{6} + \frac{3.922' \times 5.52'}{164} = 141 \text{ LBS/BOLT (MAX) (621 N/BOLT)}
\]
USE 6 M20 A512 threaded rods from interface plate to support structure (bolt group 23")

LOADS:
WEIGHT = 113 lbs (503 N)
HORIZONTAL FORCE (N_H) = 106 lbs (472 N)
VERTICAL FORCE (N_V) = 35 lbs (156 N)

BOLT GROUP PROPERTIES:

\[
\begin{align*}
[X - X] &= 256\text{ in.}^2/\text{BOLT} (165161\text{ mm}^2/\text{BOLT}) \\
[12 - 2] &= 256\text{ in.}^2/\text{BOLT} (165161\text{ mm}^2/\text{BOLT}) \\
[Y - Y] &= 512\text{ in.}^2/\text{BOLT} (330522\text{ mm}^2/\text{BOLT})
\end{align*}
\]

MOMENTS:

\[
\begin{align*}
M_{XX} &= 106\#(40") + (113\# + 35\#)(31") = 9.716\# (1048\text{ N-m}) \\
M_{YY} &= 106\#(40") + (113\# + 35\#)(31") = 9.716\# (1048\text{ N-m}) \\
M_{YZ} &= 106\#(31") = 34224\# (443\text{ N-m})
\end{align*}
\]

BOLT FORCES:

TENSION (T)

\[
T = \frac{9.716\#(40")}{256} + \frac{113\# + 35\#}{6} = 316\text{ LBS/BOLT (MAX)} (1619\text{ N/BOLT})
\]

SHEAR (V)

\[
V = \frac{106\#}{6} + \frac{34224\#(9.25")}{512} = 89\text{ LBS/BOLT (MAX)} (396\text{ N/BOLT})
\]
NOTES:

1. FORCES ARE DETERMINED PER 2001 CALIFORNIA BUILDING CODE - SECTION 1627A
   AND HAVE BEEN FACTORED TO REPRESENT WORKING DESIGN LOADS, NOT ULTIMATE LOADS.
   HORIZONTAL FORCE ($V_h$) = 0.94H - (C = 66, $l_p$ = 15, $a_p$ = 1.0, $R_p$ = 3)
   VERTICAL FORCE ($V_v$) = 0.35$V_h$

2. CENTER OF GRAVITY (CG) HEIGHT IS AN ESTIMATE. THIS CALCULATION ENCOMPASSES ALL WEIGHTS UP TO THE MAXIMUM HEIGHT SHOWN.

3. ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT WEIGHTS AND FORCES SHOWN.
LOADS:
HEIGHT = 174 LBS (796 N)
HORIZONTAL FORCE (V_H) = 168 LBS (741 N)
VERTICAL FORCE (V_V) = 50 LBS (224 N)

BOLT GROUP PROPERTIES:
1 X-X = 85 IN.²/BOLT (849.9 mm²/BOLT)
2 Y-Y = 164 IN.²/BOLT (1049.3 mm²/BOLT)

MOMENTS:
MXX = 168(40°) + (174 + 56)38° = 15,650°° (1168 N-m)
MYY = 168(38°) = 6,354°° (121 N-m)

BOLT FORCES:
TENSION (T)
\[ T = \frac{15,650°°(5.32°)}{85} + \frac{174 + 56°}{6} = 1014 \text{ LBS/BOLT (MAX)} (4533 \text{ N/BOLT}) \]

SHEAR (V)
\[ V = \frac{168°}{6} + \frac{6,354°°(5.32°)}{104°} = 224 \text{ LBS/BOLT (MAX)} (1014 N/BOLT) \]
PLATE AT INTERFACE PLATE

LOADS:
HEIGHT = 179 LBS (196 N)
HORIZONTAL FORCE (Vh) = 168 LBS (741 N)
VERTICAL FORCE (W) = 56 LBS (249 N)

BOLT GROUP PROPERTIES:
\[ |X-X| = \frac{256 \text{ in}^2}{\text{BOLT}} (16516\text{mm}^2/\text{BOLT}) \]
\[ |Y-Y| = \frac{512 \text{ in}^2}{\text{DOLT}} (330322\text{mm}^2/\text{DOLT}) \]

MOMENTS:
\[ M_{XX} = 168^\circ(40^\circ) + (179^\circ + 56^\circ)38^\circ = 15650^\circ (1768 \text{ N-m}) \]
\[ M_{YY} = 168^\circ(38^\circ) = 6554^\circ (121 \text{ N-m}) \]

BOLT FORCES:
TENSION (T)
\[ T = \frac{15650^\circ(4.25^\circ)}{256} + \frac{179^\circ + 56^\circ}{6} = 605 \text{ LBS/BOLT (MAX)} (2691 \text{ N/BOLT}) \]

SHEAR (V)
\[ V = \frac{168^\circ}{6} + \frac{6554^\circ(4.25^\circ)}{512} = 148 \text{ LBS/BOLT (MAX)} (636 \text{ N/BOLT}) \]
1. Forces are determined per 2001 California Building Code - Section 1614.1A and have been factored to represent working design loads, not ultimate.

   - Horizontal force \( (V_h) = 0.44W - (C_G = 66, I_p = 13, o_p = 1.0, R_p = 3) \)
   - Vertical force \( (V_v) = 0.33W \)

2. Center of Gravity (C.G.) height is a maximum. This calculation encompasses all heights up to the maximum height shown.

3. Engineer of record for the building shall provide support structure designed to support heights and forces shown.
PLAN AT FLANGE PLATE

LOADS:
HEIGHT = 246 LBS (1094 N)
HORIZONTAL FORCE (M1) = 231 LBS (1028 N)
VERTICAL FORCE (M2) = 71 LBS (343 N)

BOLT GROUP PROPERTIES:
|x-x| = 85 in²/BOLT (54834 mm²/BOLT)
|z-z| = 85 in²/BOLT (54834 mm²/BOLT)
|y-y| = 164 in²/BOLT (109452 mm²/BOLT)

MOMENTS:
\[ M_{xx} = 231 \times 40 + (246 + 71) \times 34 = 21,837 \times (2467 N\cdot m) \]
\[ M_{zz} = 231 \times 40 + (246 + 71) \times 34 = 21,837 \times (2467 N\cdot m) \]
\[ M_{yy} = 2514 \times 34 = 86,090 \times (1016 N\cdot m) \]

BOLT FORCES:
TENSION (T)
\[ T = \frac{21,837 \times 5.32}{85} + \frac{246 \times 71}{6} = 1421 \text{ LBS/BOOLT (MAX) (6321 N/BOLT)} \]

SHEAR (V)
\[ V = \frac{231}{6} + \frac{86,090 \times 5.32}{164} = 322 \text{ LBS/BOOLT (MAX) (1432 N/BOLT)} \]
LOADS:
WEIGHT = 246 LBS (1094 N)
HORIZONTAL FORCE (V_H) = 231 LBS (1028 N)
VERTICAL FORCE (V_V) = 77 LBS (343 N)

BOLT GROUP PROPERTIES:
| X-X | 256 in²/BOLT (65161 mm²/BOLT) |
| Y-Y | 512 in²/BOLT (830822 mm²/BOLT) |
| Z-Z | 80 in²/BOLT (193723 mm²/BOLT) |

MOMENTS:
M_{XX} = 221\#(40) + 246\# + 71\# = 21,837\# (2467 N-m)
M_{YY} = 221\#(39) + 246\# + 71\# = 21,837\# (2467 N-m)
M_{ZZ} = 9,009\# (1018 N-m)

BOLT FORCES:
TENSION (T)
\[ T = \frac{21,837\#(9.25)}{256} + \frac{246\# + 71\#}{6} = 843 LBS/BOLT (MAX) (3750 N/BOLT) \]

SHEAR (V)
\[ V = \frac{221\# + 9,009\#(9.25)}{512} = 201 LBS/BOLT (MAX) (894 N/BOLT) \]
NOTES:
1. FORCES ARE DETERMINED PER 2001 CALIFORNIA BUILDING CODE - SECTION 5.2A. 
AND HAVE BEEN FACTORED TO REPRESENT WORKING DESIGN LOADS, NOT UL.
HORIZONTAL FORCE (V_H) = 0.44N - (C_o = 0.6, 1_p = 1.5, a_p = 1.0, R_p = 3).
VERTICAL FORCE (V_V) = 0.35N_H.
2. CENTER OF GRAVITY (C.G.) HEIGHT IS A MAXIMUM. THIS CALCULATION ENCOMPASSES ALL HEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.
3. ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT HEIGHTS AND FORCES SHOWN.
LOADS:
- Weight = 214 LBS (452 N)
- Horizontal force (V_H) = 201 LBS (894 N)
- Vertical force (V_V) = 61 LBS (270 N)

BOLT GROUP PROPERTIES:
- X-X = 85 IN² / BOLT (5434 mm² / BOLT)
- Y-Y = 164 IN² / BOLT (10403 mm² / BOLT)
- 2-2 = 85 IN² / BOLT (5434 mm² / BOLT)

MOMENTS:
- M_X = 201\#(44\#) + (214\# + 61\#)(33\#) = 141122\# (2161 N-m)
- M_Y = 201\#(33\#) = 6633\# (1441 N-m)

BOLT FORCES:
TENSION (T)
- T = \frac{141122\#(53\#)}{85} + \frac{214\# + 61\#}{6} = 1244 LBS / BOLT (MAX) (3534 N / BOLT)

SHEAR (V)
- V = \frac{201\#}{6} + \frac{6633\#(53\#)}{164} = 242 LBS / BOLT (MAX) (1076 N / BOLT)
LOADS:

HEIGHT = 214 LBS (952N)
HORIZONTAL FORCE (Vx) = 201 LBS (894 N)
VERTICAL FORCE (Vy) = 67 LBS (298 N)

BOLT GROUP PROPERTIES:

\[ |x-x| = \frac{256 \text{ in}^2}{\text{BOLT}} \times \frac{16516 \text{ mm}^2}{\text{BOLT}} \]
\[ |z-z| = \frac{256 \text{ in}^2}{\text{BOLT}} \times \frac{16516 \text{ mm}^2}{\text{BOLT}} \]
\[ |y-y| = \frac{512 \text{ in}^2}{\text{BOLT}} \times \frac{159032 \text{ mm}^2}{\text{BOLT}} \]

MOMENTS:

\[ M_{XX} = 20 \# (49^\circ) + (214^\circ + 67^\circ) \times 33^\circ = 14,122^\# (2161 \text{ N-m}) \]
\[ M_{ZZ} = 20 \# (49^\circ) + (214^\circ + 67^\circ) \times 33^\circ = 14,122^\# (2161 \text{ N-m}) \]
\[ M_{YY} = 20 \# (22^\circ) = 6333^\# (144 \text{ N-m}) \]

BOLT FORCES:

TENSION (T):

\[ T = \frac{14,122^\# (49^\circ)}{256} + \frac{201^\# + 67^\#}{5} = 136 \text{ LBS/BOLT (MAX)} (3214 \text{ N/BOLT}) \]

SHEAR (V):

\[ V = \frac{201^\#}{5} + \frac{6333^\# (49^\circ)}{512} = 153 \text{ LBS/BOLT (MAX)} (681 \text{ N/BOLT}) \]
Appendix B: Seismic Calculations (LED Surgical Lights)

Office of Statewide Health Planning and Development
ANCHORAGE PRE-APPROVAL
OPA-1649

Equipment Manufacturer: Stryker Communications
Equipment Type: Stryker EDS Light Suspension

GENERAL NOTES

1. FORCES ARE DETERMINED PER 2001 CBC 1632A.2, EQUATIONS 32-A1, A2 & A3, WHERE C_a = .66, A_p = 2.5, I_p = 1.5
   AND R_p = 3.0
   PLEASE NOTE THAT THE RESULT FROM EQUATIONS 32-A1, A2 & A3
   HAVE BEEN REDUCED BY A FACTOR OF 1.4 FOR ALLOWABLE STRESS DESIGN.

2. THIS PRE-APPROVAL CONFORMS TO THE 2001 CALIFORNIA BUILDING CODE.

3. THE DETAILS IN THIS PRE-APPROVAL MAY BE USED AT ANY LOCATION AND AT ANY HEIGHT IN THE STATE OF CALIFORNIA.

4. THE ENGINEER OF RECORD SHALL DESIGN BACKING BARS, STUDS, FRAMES ABOVE THE CEILING, ETC.
   WHICH THE UNITS ARE ATTACHED TO AS NOTED ON THE DRAWINGS. THE ENGINEER OF RECORD
   SHALL ALSO VERIFY THE ADEQUACY OF THE STRUCTURES (SUCH AS WALLS AND FLOORS)
   WHICH SUPPORT THE UNITS FOR THE LOADS IMPOSED ON THEM BY THE UNITS AS WELL AS ALL OTHER LOADS.

5. ALL ANCHOR FORCES SHOWN ON THE DRAWINGS ARE WORKING LOADS (AS OPPOSED TO ULTIMATE LOADS)
   AND MAY BE USED FOR ALLOWABLE STRENGTH DESIGN.

[Signature]

[Stamp]
OPA-1649

fixed Equipment Anchorage
Office of Statewide Health Planning and Development

Anthony R. Pike
(916) 654-3362

Wednesday, March 7, 2007
USE 6-5/8" (16mm) A444 (or grade 5) threaded rods from bearing plate to structural ceiling plate.

C.G. Wt. = SEE SCHED.

NOTES:

1. ANCHORAGE DESIGN PER 2001 CALIFORNIA BUILDING CODE - SECTION 1632A AND HAVE BEEN FACTORED TO REPRESENT WORKING DESIGN LOADS, NOT ULTIMATE.
   HORIZONTAL FORCE ($V_h = 1.1T_{\theta}(C_o = .66, f_o = 15, a_{p} = 2.5, R_{p} = 3.0)$
   VERTICAL FORCE ($V_v = 0.35 W_p$)

2. CENTER OF GRAVITY (C.G.) WEIGHT IS A MAXIMUM. THIS PRE-APPROVAL ENCOMPASSES ALL WEIGITS UP TO THE MAXIMUM WEIGHT SHOWN.

3. ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT WEIGHTS AND FORCES SHOWN, IN ADDITION TO ALL OTHER LOADS.

4. SEE GENERAL NOTES: SHEET 1

APPROVED
Fixed Equipment Anchorage
Office of Statewide Health Planning and Development
OPA-1649
on
Wednesday, March 7, 2007
Anthony R. Pike
(916) 654-3362
USE 6 - 5/8" x (16mm) A449 (or grade 5) THREADED RODS FROM BEARING PLATE TO STRUCTURAL CEILING PLATE

PLAN AT BEARING PLATE
SECTION A-A

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<th>MODEL (ARM LENGTH)</th>
<th>MAX WEIGHT (lbs)</th>
<th>X (in)</th>
<th>Y (in)</th>
<th>Max &amp; Mzz (lbs/boit)</th>
<th>T max (lbs/boit)</th>
<th>V max (lbs/boit)</th>
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</table>

APPED
Fixed Equipment Anchorage
Office of Statewide Health Planning and Development
OPA-1649
on
Wednesday, March 7, 2007

Anthony R. Pike
(916) 654-3362
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