

SKYTRON MOUNTING STRUCTURES for Ceiling Mounted Equipment

Foreword

Skytron's objective is to provide a program and guideline to assist individuals (hospital owners, architects, structural engineers) responsible for the design of mounting structures.

The mounting structure of a Skytron fixture should always be considered the most important detail of any project prior to installation. Skytron's ceiling mounted systems depend upon properly designed and installed mounting structures to deliver years of dependable, service-free performance.

We realize that individual mounting structures vary in design due to unique structural requirements, physical obstructions, structural member availability and room layout limitations, to name a few.

The mounting structure design in this Mounting Structure Guideline Booklet is a successful, proven design. The design consists of a welded, "flanged tube" assembly combined with (4) angled sway braces ("kickers"). A structural steel tube combined with welded steel plates on each end facilitate its attachment to the structural ceiling and provide an attachment point for the Skytron fixture. This is a simple effective design that is forgiving to restricting structural conditions that are usually encountered during fabrication.

This design also eliminates "guess work" by the steel fabricator when compared to structures that are fabricated on site with angle iron. In many cases the "flanged tube" assembly can be pre-fabricated reducing the on-site construction time and eliminating the need to correct structural problems associated with angle iron structures.

The process of building a proper mounting structure can be complemented with Skytron's continued support on the project. Once the structures are fabricated, Skytron will perform a visual inspection and on-site consultation followed by an actual performance test. The performance test of the structure essentially involves hanging a "test jig" from the structure, and then measuring the amount of rotation that occurs at the mounting plate using an inclinometer (digital level). The test jig is similar in size, shape, and weight to a Skyboom. In other words, once the test jig is installed and the proper weights have been added to simulate the product's moment load, a reading is taken on the digital level to verify that there is no more than two-tenths of a degree of rotational movement at the mounting plate.

Rotation of the mounting plate causes the radial arm(s) to become out of level and drift. For a structure to meet Skytron specifications, we require that the mounting plate does not rotate more than two-tenths of a degree while loaded with the specified weight and moment.

The testing process should occur in the early stages of construction to provide optimal time if additional reinforcement is needed on the structure. This should be performed prior to the completion of the finished ceiling.

Skytron's program is available to help you and provide you with the necessary counseling. However, the final responsibility to insure that the structure is adequate and meets specification lies with the structural engineer and the contractor for the project.

Our support services are geared to minimize the effort on all parties involved and to insure a successful product installation.

This Mounting Structure is applicable for all SKYTRON Skyboom models.

We recognize that not all situations will permit the use of this "Tube Structure". Please contact SKYTRON with your special needs so that we may be able to guide you to other alternatives.

EXHIBIT "B.3"
INSTALL OPERATING ROOM BOOMS
PHASE 2
PROJECT NO.: 618-12-302
BOOM MOUNTING INFO

INTRODUCTION

This publication is meant to provide the information needed to design and build a mounting structure that will provide the proper support for a SKYTRON Skyboom fixture as well as the guidance for supplying the necessary services. The responsibilities and items supplied by both SKYTRON and the Customer for pre-installation of the fixture will vary depending on the equipment and services that will be provided on the Skyboom fixture. The mounting structure requirements however, are the same for all models. The structure design is based on the heaviest Skyboom model with the greatest moment load. By using this criteria, one structure design can be utilized to minimize design costs and provide adequate support for future modifications. If applicable, specific Seismic Calculations can be provided from SKYTRON. The Mounting Structure design should always be approved by a Structural Engineer. An inadequate Mounting Structure may allow drifting and other performance problems for the fixture. Equipment warranty or service charges due to an inadequate Mounting Structure are at the customer's expense. SKYTRON does not warrant or certify superstructure designs.

This publication is intended to address various areas and responsibilities of multiple individuals. It is important that this information is shared with:

- Architects and Structural Engineer
- Electrical Engineer
- Medical Gas/Piping Engineer
- Communication/Video/Data Engineer
- Project Manager(s)

SKYTRON Supplied Components

SKYTRON supplies the following items to assist in the design and construction of the mounting structure:

- Customer approved room layout and Skyboom configuration drawings.
- Skyboom mounting plate
- Medical gas riser plate with appropriate medical gas connectors
- Electrical junction box
- Fixture mounting hardware
- Pump Enclosure (if applicable)

CUSTOMER Supplied Components and Responsibilities

Mounting Structure - Architect and Structural Engineer

- ✱ The Customer is responsible for the design and fabrication of the structure which connects the SKYTRON mounting plate to the structural ceiling. The mounting plate must be perfectly level ($\pm 0.1^\circ$). The design and fabrication must include the necessary bracing to prevent twisting or lateral motion and to allow no more than two-tenths of a degree (0.2°) of rotation at the mounting plate when the specified load is applied.

Refer to Page 5 for recommended specifications.

An inadequate mounting structure can result in damage to the equipment. Equipment warranty charges related to an inadequate structure design or installation are at the customer's expense. The mounting structure design specifications included in this publication depict a successful, proven design. The actual building design, additional loading required by local building codes and various obstacles may exist that do not allow this design system to be followed. It is the customer's responsibility to provide the appropriate alternate mounting structure. SKYTRON recommends that a Structural Engineer be consulted whenever a design variation is needed.

Electrical Provisions - Electrical Engineer

Each Skyboom fixture is fabricated in accordance to the specifications required by the customer. The customer is responsible for the appropriate electrical supply to the fixture. The Configuration drawings supplied by SKYTRON will indicate the type and quantity of circuits required. The customer is responsible for connections from facility supply to fixture, wall control and wiring installation for surgical lights and pump motor connection if applicable.

Refer to Page 7 for Electrical Requirements.

Medical Gas Provisions - Medical Gas/Piping Engineer

Each Skyboom fixture is fabricated in accordance to the specifications required by the customer (to include the type of faceplate connectors to be provided on the fixture). The customer is responsible for the appropriate medical gas supply and connection to the fixture. The Configuration drawings supplied by SKYTRON will indicate the type and quantity of gas supply lines required.

Refer to Page 7 for Medical Gas Requirements.

Communications Provisions - Communication/Video/Data Engineer

Each Skyboom fixture is fabricated in accordance to the specifications required by the customer. The customer is responsible for the appropriate communication cable routing to the fixture. The Configuration drawings supplied by SKYTRON will indicate the type and quantity of cables required.

Refer to Page 7 for Communications Requirements.

Testing

NOTE

A visual review of the mounting structure construction should be requested before the finished ceiling is installed to detect possible interference potentials, and arrangements can be made to conduct a load simulation using a Test Jig. This process is designed to simulate the fixture load and is an effective means to determine where the structure may require improvement. It is not a certification of the structure.

The customer is responsible for the testing and any necessary certification requirements for all system utilities prior to the installation of the Skyboom fixture. The testing and certification must be in accordance with all state, federal, local, NFPA and NEC codes and must include the following items:

Mounting Structure (Testing performed by Skytron)
Electrical Wiring
Medical Gas Supply

INSTALLATION KIT

SKYTRON provides an installation kit which is typically shipped in advance and contains all of the Skytron supplied components required for pre-installation and the fabrication of the Skyboom Mounting Structure. The Installation Kit includes the following:

- Customer approved room layout and Skyboom configuration drawings.
- Mounting Plate
- Medical gas riser plate(s) with appropriate D.I.S.S. medical gas connectors
- Electrical junction box
- Mounting hardware for riser plate and junction box

EXHIBIT "B.3"
INSTALL OPERATING ROOM BOOMS
PHASE 2
PROJECT NO.: 618-12-302
BOOM MOUNTING INFO

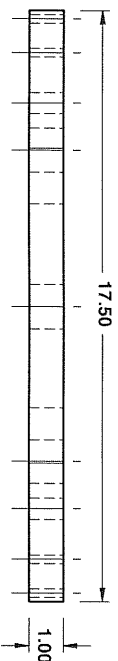
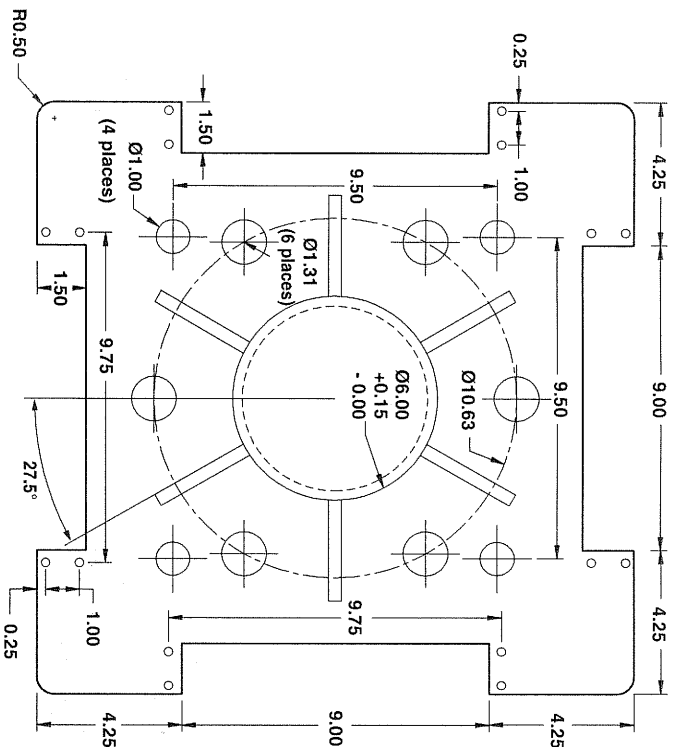


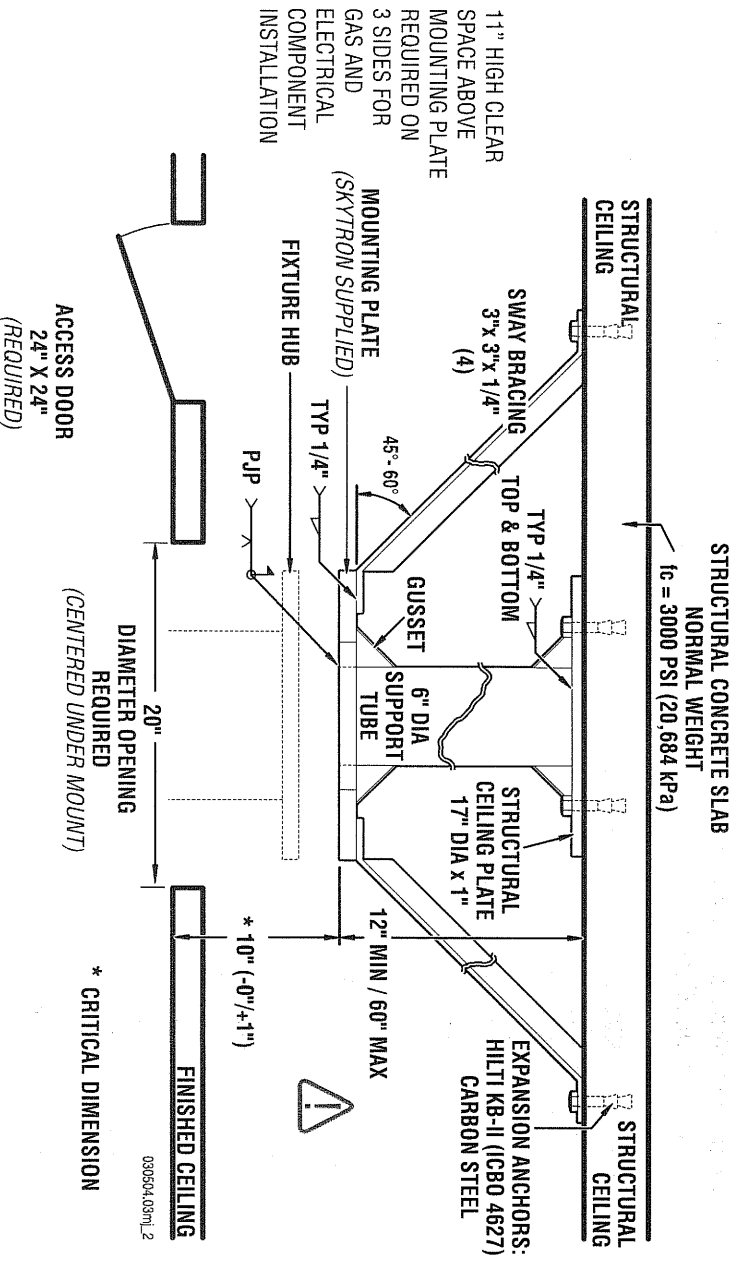
EXHIBIT "B.3"
INSTALL OPERATING
ROOM BOOMS PHASE 2
PROJECT NO.:
618-12-302
BOOM MOUNTING INFO



030504.02b

NOTE: This illustration depicts a typical mounting structure design and its components. Always consult specific structural criteria defined by a structural engineer.

NOTE: Do not cover or block any holes with sway bracing, gussets, weld, weld slag or etc.



NOTE: Typical dimensions shown. Refer to specific structural drawings and/or Seismic drawings for each application.

STRUCTURAL REQUIREMENTS - Architect and Structural Engineer

MOUNTING STRUCTURE COMPONENTS

The fabrication of each mounting structure may be slightly different but they each require the same basic components to ensure stability. Refer to the figure on page 4 for the relationship of these components.

~~X~~ Sway Bracing (by others)

Sway bracing is designed to rigidly affix the Mounting Plate to the structural ceiling. The primary purpose of Sway Bracing is to eliminate sway, or lateral twisting and flexing of the mounting structure as it "reacts" to dynamic load changes caused by moving the fixture radial arms. The sway bracing should be welded to the Mounting Plate and extend away from the center of the mount. A minimum of four sway braces placed 90° apart and positioned at a 45° to 60° angle is recommended.

Minimum recommended material for sway bracing is 3" x 3" x 1/4" angle iron. **It is recommended that in all applications that the sway bracing be fastened to the structural ceiling.**

~~X~~ Structural Ceiling Plate (by others)

The Structural Ceiling Plate rigidly attaches the mount to the Structural Ceiling using structural anchors appropriate for the ceiling construction. The Structural Ceiling Plate should be a minimum of, 1" ASTM A36 steel plate, 17" diameter with (6) 5/8" diameter holes for structural anchors and is fabricated by others.

Expansion Anchors

Test 50% of the anchors at 2000 pounds (907 kg) tension, or 50 ft lb (68 N•m) torque per CBC 1925A.3.5. Installed anchors must meet the following criteria:

1. *Hydraulic Ram Method*: The anchor should have no observable movement at the applicable test load. For wedge and sleeve type anchors, a practical way to determine observable movement is that the washer under the nut becomes loose.
2. *Torque Wrench Method (Wedge or Sleeve Type)*: The applicable test torque must be reached within one-half (1/2) turn of the nut. Testing should occur no sooner than 24 hours after installation of anchors. If any anchor fails testing, test all anchors until 20 consecutive anchors pass, then resume the initial testing frequency. Test equipment is to be calibrated by an approved testing laboratory in accordance with standard recognized procedures.

Support Tube (by others)

The Support Tube required to attach the Mounting Plate to the Structural Ceiling Plate is ASTM 500 Grade B, 6" diameter tube. Support Tube is to be welded to Structural Ceiling Plate and Mounting Plate. A minimum of 6 gussets placed 60° apart should be welded to the support tube at the structural ceiling plate and the Mounting Plate.

Mounting Plate (Skytron supplied)

The 17.5" x 17.5" x 1" ASTM A36 steel Mounting Plate is a Skytron supplied item. The Support Tube and Sway Bracing are welded to the Mounting Plate. The mounting plate contains the corresponding bolt pattern for attaching the fixture and provides the mounting areas for the junction box and gas riser plates.

MOUNTING STRUCTURE DESIGN

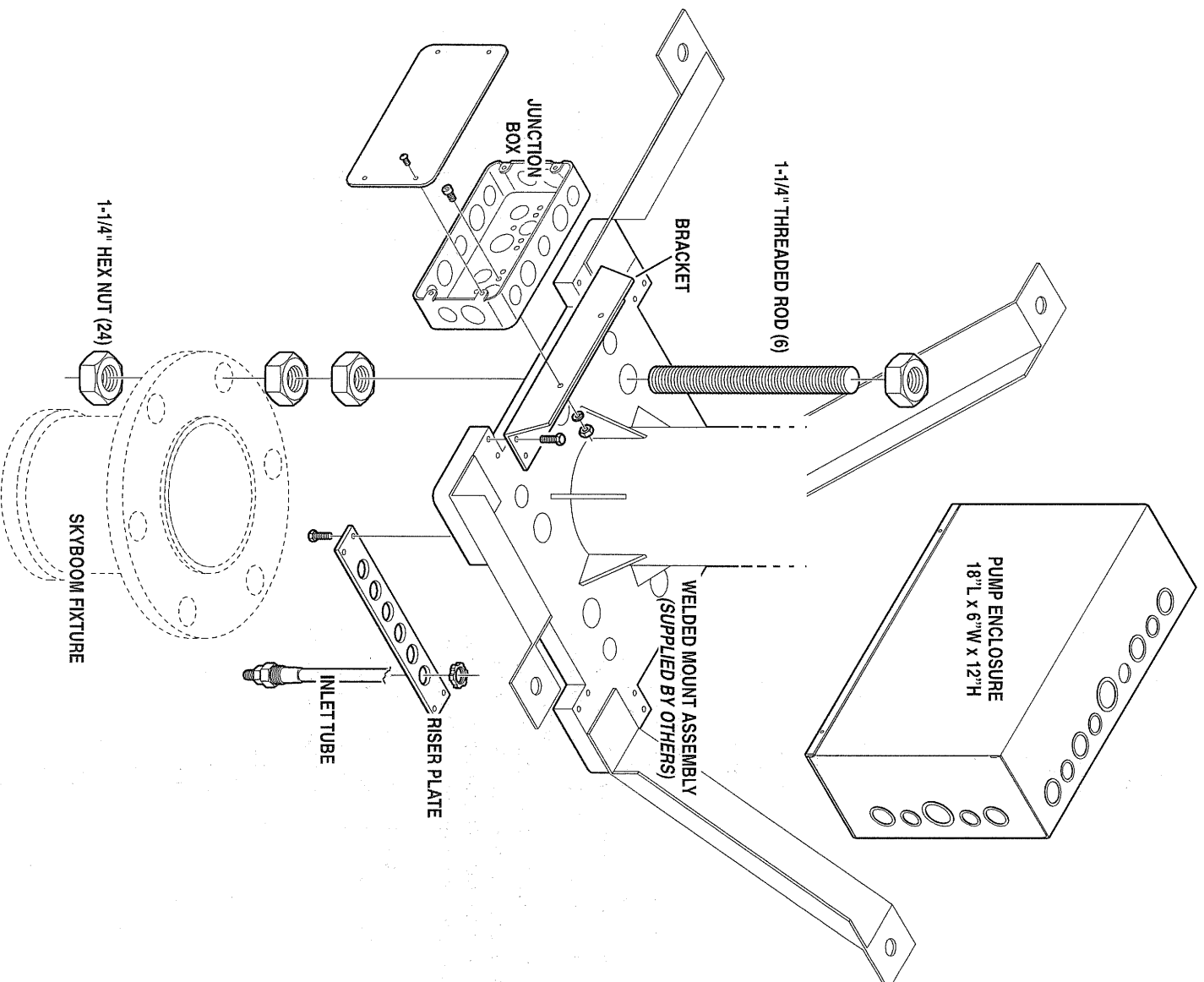
Seismic structural applications may differ. Please contact your local SKYTRON distributor for specific calculations. The Mounting Structure **must** be designed and fabricated to position **the bottom of the SKYTRON Mounting Plate 10" (-0" +1") above the finished ceiling**. This is a critical dimension in order to accommodate proper clearance required for ceiling cover function. The mounting plate must be perfectly level ($\pm 0.1^\circ$) and allow no more than two-tenths of a degree (0.2°) of rotation at the mounting plate when the specified load is applied. **The Mounting Structure must be tested** for strength and stiffness prior to installation of the fixture. A Test Jig is available from SKYTRON that includes all components and documentation required for performing an approved Mounting Structure test. Refer to page 8 for testing procedures.

Please consult your SKYTRON representative during early stages of construction to facilitate this process. The testing process is a required, documented function prior to closing of the finished ceiling.

Ceiling Requirements

A 24" x 24" access door must be mounted adjacent to the mounting structure for entry by service personnel for service access.

SKYTRON provides a 24" diameter ceiling cover designed to cover a 20" diameter ceiling hole cutout.



036504.04/r

NOTE: This illustration depicts a typical mounting structure design and its components. Always consult specific structural criteria defined by a structural engineer.
Mounting bolts and nuts shipped with fixture.

EXHIBIT "B.3"
INSTALL OPERATING ROOM BOOMS
PHASE 2
PROJECT NO.: 618-12-302
BOOM MOUNTING INFO

Electrical Requirements - Electrical Engineer

Each Skyboom fixture is fabricated in accordance to the specifications required by the Electrical Engineer. The Configuration drawings supplied by SKYTRON will indicate the type and quantity of circuits required. SKYTRON provides all wiring and electrical materials for connection from fixture to junction box or pump enclosure (if applicable). SKYTRON supplies either an electrical junction box to facilitate field wiring for up to six circuits that is mounted on the mounting plate in the correct position OR if applicable, a hydraulic pump enclosure/junction box (18"L x 6"W x 12"H) that is to be remote mounted within 24" of the mounting structure (by contractor). The pump enclosure can be shipped with the Installation Kit upon request. Typical wire type is 12AWG, 600V, XHHW-2. Each circuit requires a separate, properly circuit protected, 120 VAC, 60 Hz power supply line enclosed in rigid metal conduit. All electrical materials for connection to SKYTRON supplied junction box or pump enclosure and installation labor for such materials to be provided by customer. All wiring and materials to be in accordance with federal, state and local codes. It is the customers responsibility to meet conformity to NFPA and NEC standards with respect to the number of receptacles provided in a patient care area. (Page 4 - Drawing Package)

Medical Gas Requirements - Medical Gas/Piping Engineer

NOTES: Medical gas riser plates comply with NFPA 99-2005 Edition

Cleanliness of gas outlets must be maintained through installation.

Purge gas lines and test at least 24 hrs. prior to installation.

Test results must be made available to SKYTRON for verification & comparison.

Each Skyboom fixture is fabricated in accordance to the specifications required by the customer. The Configuration drawings supplied by SKYTRON will indicate the type and quantity of gas supply lines required. D.I.S.S. connection medical grade hoses connect the fixture to the Riser Plate connectors. The customer is responsible to deliver the appropriate medical gas from the facility supply to the Riser Plate connectors and for the design of a medical gas system with adequate flow capacity capable of compensating for the accumulative flow restrictions associated with conventional construction methods i.e. flex gas hoses.

SKYTRON provides medical gas riser plate(s) and the appropriate connectors for attachment to the Mounting Plate. The Riser Plate attaches to the Mounting Plate and will accommodate up to 12 gas connectors. The connectors are D.I.S.S. type medical gas connectors with single check valves and provide a 1/2" copper tube for attachment to facility supply lines. Caps are provided with Vacuum & WAGD gas connectors to facilitate testing procedures.

All connection and testing of Medical Gas Piping to be performed in accordance with NFPA 99-2005 Edition-5.1.6 requirements.

- Evacuation lines and fittings rated at 70-75 l/min (2.47-2.64scfm) at user connection point.
- Vacuum lines (WAGD) and fittings rated at 85 l/min (3 scfm), based on 115 l/min facility supply
- Nitrogen system requires Nitrogen supplied directly from facility supply at 185 psi minimum to 200 psi maximum (if applicable). Avoid designs which feature multiple in-line Nitrogen control systems in order to avoid loss of flow capability. (Page 3 - Drawing Package)

Recommended Gas Riser Placement - When mount is in center of room, Riser Plate should face head end of room, when mount is near walls, Riser Plate should be adjacent to wall. If more than one Riser Plate is required they should be placed next to each other.

Communications Requirements - Communication/Video/Data Engineer

Each Skyboom fixture is fabricated in accordance to the specifications required by the customer. The Configuration drawings supplied by SKYTRON will indicate the type and quantity of cables required. The customer is responsible for the appropriate communication cable routing to the fixture. Special arrangements can be coordinated for custom cable sets to be installed at the time of installation. Contact your SKYTRON representative. (Page 5 - Drawing Package)

ADDITIONAL SKYTRON SUPPLIED ITEMS

In addition to the installation kit as outlined on page 3, SKYTRON provides the following items:

- (6) 1-1/4" x 10" Threaded Rods, (24) 1-1/4" Hex Nuts, Pump Enclosure (if applicable)

TESTING - MOUNTING STRUCTURE

Each mounting structure must be tested by a SKYTRON representative to verify that there is no more than two-tenths of a degree of rotational movement at the mounting plate prior to installing a fixture. A Mounting Structure Test Jig is available from SKYTRON to facilitate this process. The Mounting Structure Test Jig is a fixture which simulates the weights and moment loads created by the SKYTRON fixture. It consists of a Hub Assembly, an Upper and Lower Radial Arm, a Chain Fall, Weight Support Tube and six 100lbs. weights (refer to illustration on page 9).

The Drawing Package and the Test Jig Instructions are required to perform an accurate test.

The Test Jig Instructions include the Load Simulator Weight Chart, the Test Jig Report Form and complete instructions for performing the test.

RECOMMENDED TOOLS

- Ladder(s)
- 19mm Socket (3/8" Drive) or 19mm wrench
- Genie Lift / Overhead Hoist
- 3/8" Drive Ratchet
- Two 1-7/8" wrenches
- Two or more people capable of lifting 100 lbs.
- Appropriate cart

SKYTRON MOUNTING STRUCTURE TEST JIG

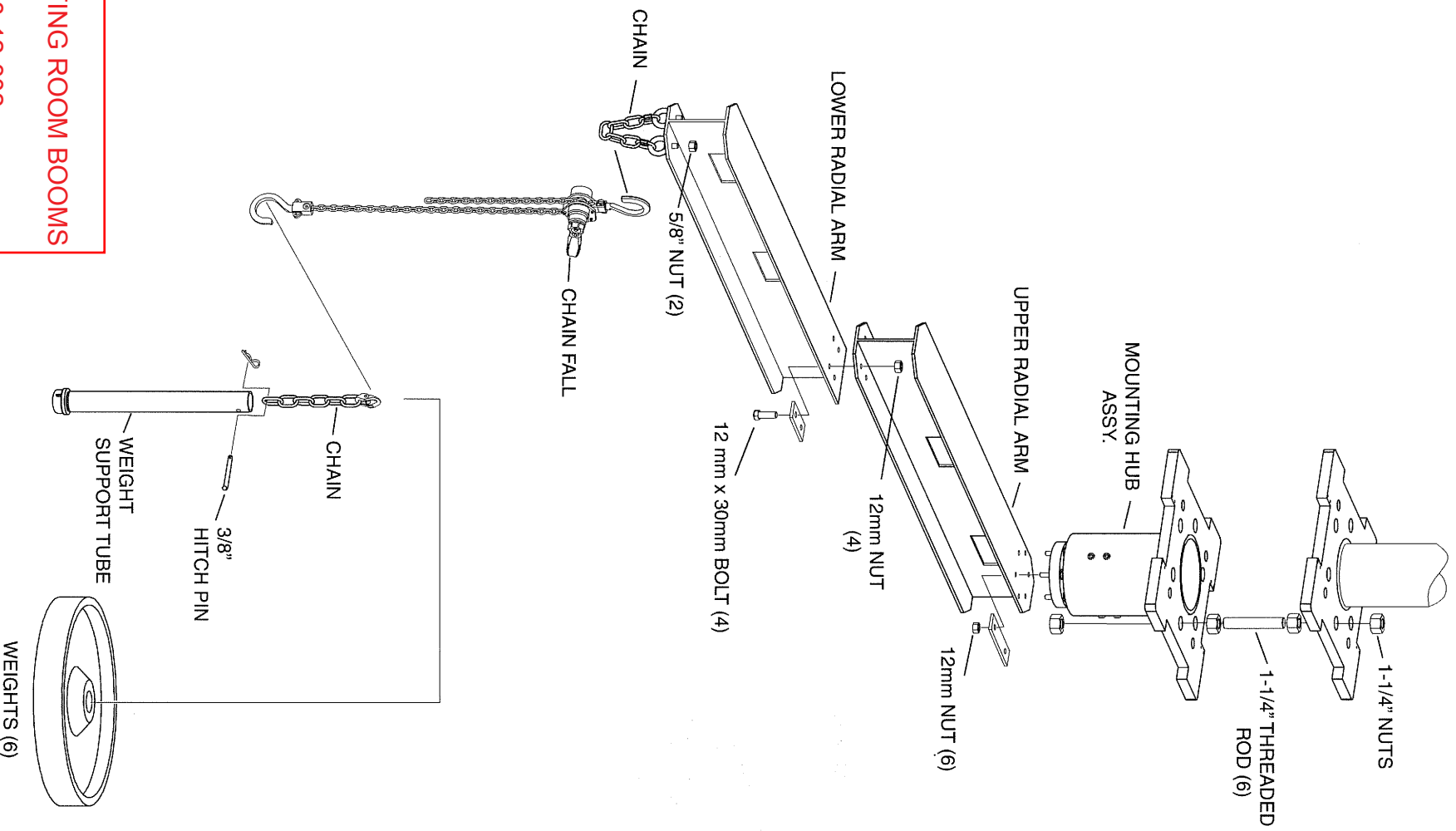


EXHIBIT "B.3"
INSTALL OPERATING ROOM BOOMS
PHASE 2
PROJECT NO.: 618-12-302
BOOM MOUNTING INFO