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TIERCON

TIERCON CORP.

CHECKING FIXTURE STANDARD


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0.1 Revision Log

Section No.	Description of Revision	Revision Level	Date
All	- New Release for New Tiercon, 1675386 Ontario Inc.	Revision 000	April 21, 2009
All	- Update language and specification for use with Horizontal Arm CMM.	Revision 001	October 12, 2011
All	- Added Headers and Footers and update language	Revision 002	April 12, 2012
5.0 Fixture Standard	Updated Fixture Standard	Revision 003	November 2, 2017
All	Updated Header		
5.3	Added CMM table size and working envelope.	Revision 4	June 6, 2018
All	Updated Header	Revision 005	September 3, 2019
4.0	Added Requirement for Equipment Proposal		
5.0	Updated Fixture Standard		
7.0	Added Safety Requirement		
8.0	Added Ergonomic Requirement		
Appendix	Added Appendix		

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1.0 Scope


Tiercon Fixture Standard: Hereinafter may be called the “Specification”

The scope of this document is to provide general specifications for the design and fabrication of industrial equipment. Tiercon has implemented the “Tiercon Fixture Standard” as a communication tool to ensure that equipment shall be built for maximum safety, performance and maintainability. This specification shall represent a baseline, which may assist Tiercon employees in policing the design, fabrication and purchase of industrial equipment. This specification is also intended for use by our Suppliers, to communicate clearly, Tiercon’s expectations in quality for industrial equipment.

We do not wish to limit the creativity of our suppliers or their suggestions relating to new technology and improved methods of accomplishing our goals. We wish to instill an open line of communication with our suppliers and request that our employees are involved in decisions that may conflict with these specifications.


The “Tiercon Fixture Standard” is intended to promote.

- Safety
- Environmental Awareness and Improvements
- Component Consolidation
- Minimum Purchase and Operational Costs
- Focused Supplier Support
- Conservation of Energy
- Implementation of New Technology
- Long Term Planning and Development
- Equipment Capability and Repeatability
- Supplier Responsibility
- Equipment Maintainability
- Quality of Equipment, Tooling and Fixtures supplied

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2.0 General

- 2.01. All equipment proposals must include reference to the latest revision of the specification.
- 2.02. The “Specification Acknowledgement Form” must be agreed upon and completed prior to acceptance of a purchase order or commencement of any work.
- 2.03. The acceptance of the purchase order whether written or verbal shall also deem acceptance of the Specification unless indicated by the supplier in writing on the “Specification Acknowledgement Form” and endorsed by the originator.
- 2.04. Supplier of Tooling, Assembly Equipment and Fixtures must be registered to a minimum of Quality Management System Requirements Standard ISO9001:2000
- 2.05. We wish to work with suppliers that operate in a manner that will help us attain the Tiercon vision, “To be the preferred supplier of injection molded products”.
- 2.06. We shall conduct business with preferred suppliers who believe in and demonstrate the following:
- Safety – following the “Occupational Health and Safety Act and Regulations for Industrial Establishment”, Ontario, Canada as well as Rules and Regulations under the “Ministry of Environment and Energy” (MOEE)
 - Integrity
 - Teamwork
 - Speed
 - Innovation
 - Performance
 - Open Communication
 - Lawful and ethical business practice following all laws of Ontario, Canada
 - Quality
- 2.07. A penalty clause may be part of the contract for late delivery of equipment. A bonus clause may also be part of a contract for early delivery. Tiercon reserves the right to take action against poor quality tools and/or slippage in timing. This may take the form of a tool transfer and/or financial recourse against the supplier.
- 2.08. Tiercon requires equipment and tooling to meet all design and process criteria. In addition, set up, change over, maintenance and troubleshooting must be achieved safely and efficiently. All fixtures will be “quick change” with no or minimal parts which have to be exchanged during changeover. Changeover are design criteria when changeovers are inevitable.
- 2.09. The equipment shall be designed around a Total Productive Maintenance (TPM) program. Easy access to lubrication points, valves, sensors, gear boxes, motor, etc. must be considered prior to any fabrication and assembly of equipment.
- 2.010. The use of statistics by suppliers to control their own process is desirable. In addition, it is a requirement of every supplier of every piece of equipment to prove to Tiercon that the equipment and tooling is statistically capable and repeatable of meeting all specifications and requirements.
- 2.011. Equipment shall be delivered with documentation and training.
- 2.012. This document may be used by itself in whole, or with additional documents in the form of, purchase order, meeting minutes, Tiercon part design drawings, statistical specifications, plate layout, government documents, etc.

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- 2.013. Failure to meet this specification without written approval by Tiercon may result in the supplier being financially responsible for all corrections.
- 2.014. It is the supplier's responsibility to identify additional improvements that may increase the performance of any piece of equipment. Tiercon may offer reward and recognition if the improvements prove positive.

3.0 Drawings, Confidentiality and Design Review

3.1 Drawings

- 3.1.1. All drawings (Def. drawings; math data, sketches, and/or files) supplied by Tiercon are confidential and property of Tiercon. Drawings are NOT to be copied unless approved by Tiercon. All drawings supplied must be returned to Tiercon at project completion or as requested by Tiercon employee.


3.2 Confidentiality

- 3.2.1. The supplier shall be required to sign a Confidentiality Agreement prior to any drawings release by Tiercon. This document acts as a binding contract and legal agreement pertaining to all "Confidential Information".
- 3.2.2. It is standard operating procedure for Tiercon to enter into Confidentiality Agreements with its supplier. The supplier must be prepared to sign this agreement if requested.
- 3.2.3. When Confidentiality Agreements are signed, all design proposals, and drawings, math data & programs etc. become the property of Tiercon regardless of their physical location.
- 3.2.4. At the written request of Tiercon, equipment shall be designed and fabricated in camera. (Def. in camera; private, behind and enclosure, in secrecy)

3.3 Design Review

Definition of design approval: This approval is only an acknowledgement by Tiercon to the supplier that the general equipment concept is within the purchase order requirements and that all sections of the specification have been followed. This approval does not wave the responsibility of the supplier to make the equipment function as per the specification criteria established in this document and in additional documents such as the purchase order.

- 3.3.1. A design review by Tiercon shall be conducted at the detailed design stage. At this time, initial compliance to the Purchase Order, the project team will address the Specification, Safety concerns and Ergonomic issues. (Supplier and Tiercon representatives) At this point, Tiercon may provide approvals to continue.
- 3.3.2. Further review will be determined as needed by the Tiercon Project Manager. (Project/Process Engineer)
- 3.3.3. Supplier Responsibility: The supplier shall be responsible to ensure that the design is functional to all parameters documented in the Purchase Order, the Specification and any relative part drawings or layouts. If the supplier develops difficulties with any portion of the contract, it is the supplier's responsibility to inform Tiercon, in writing, of this difficulty.

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4.0 Equipment Proposal

4.0.1. All equipment proposals must conform to the latest revision of the “Tiercon Fixture Standard”.

4.0.2. Proposals must include a written breakdown of the following:

- Key mechanical components to be used
- Estimated overall dimensions
- Concept drawing
- Overall Weight
- Delivery time in weeks
- Strapping Mechanism for Fixture Transportation. Must be able to handle the weight of the fixture and cart during transportation.

4.0.3. A delivery schedule in a timeline form to be submitted at time of proposal. This schedule shall be revised at time of purchase order. The schedule will be the key tool for both parties to achieve specified milestones and avoid project pitfalls. Tiercon shall monitor this schedule for any delays to the project. This tool promotes open communication and project updates.

4.0.4. If for any reason a request for proposal declined, Tiercon requires that the request for proposal package be returned immediately.

5.0 Checking Fixture/Gauge Design Requirements

5.0.1. Base plate to be constructed of aluminum 1” thick with machined edges parallel to body or work lines and machined numerals as per location. Base plate exceeding 48” in length shall be constructed of stress relieved steel. All checking fixtures must have four tapped holes (M16) present on the base plate. If the base plate exceeds 60” in length, the location of the tapped holes should be 600mm from the center in both direction. Base plate must fully encapsulated the part and any swing out details in their fully opened position.

5.0.2. Body lines to be machined with a small cutter on base plate every 100mm for fixtures less than 60 inches and every 200mm for base plates larger than 60”. Body lines coordinates to be machined and ballooned. Stamped digits are not acceptable.

5.0.3. All checking fixtures must have a minimum of one qualifying ball press fit in a hardened steel bushing pocketed in base plate with coordinates tagged on the base. For fixtures larger than 36”, three (3) tooling balls shall be used to establish a coordinate reference plane. Each tooling ball shall be provisioned with a protective cap secured to the base plate by means of 2 screws. They will be positioned to accommodate a Horizontal Arm type CMM (i.e.; tooling ball at min 3 corners on base plate).


5.0.4. Datum Hole Locators:

- Variable & Attribute Fixtures – Datum locators should be conical spring loaded and Regardless Feature of Size (RFS) condition to locate the part accurate and repeatable in the specific direction to the datum specified.

5.0.5. CMM Table Size and Working Envelope:


- Horizontal Arm LK90 CMM – Machine working envelope is 50” (1.27m) x 114” (2.9m)
- CMM table size: 39.5” (1m) x 98.5” (2.5m)

5.0.6. Checking Fixtures must be design to allow measurements with horizontal arm CMM, with the above working envelope. Checking Fixtures should be design to not exceed the CMM table size shown in 5.0.5. If the checking fixture were to exceed the CMM table size, additional feet will be needed to sit level,

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accurately with no distortion and safely on the CMM table.

- 5.0.7. Checking Fixtures when place on the cart should not have fixture components overhang or exceed the carts perimeter. Having overhanging component is a safety concern and is not acceptable.
- 5.0.8. All blocks to be black oxide (steel) or anodized (aluminum) with a slate grey pigment. Where blocks are machined to check surface, that surface shall be identified by 3/16" diameter indented colored dots and corresponding feeler pin identified accordingly. Exceptions to hard coating apply to soft plastic parts only such as TPO parts. All sheet metal components and ABS plastic parts are to be hard coated.
- 5.0.9. All gauge pins are to be hardened and ground to size; pilot sizes are to be standard size only. Ends are to be knurled and identified with Tiercon code.
- 5.0.10. All GO/NO GO pins are to be identified with sizes and stamped "GO" and "NO GO" accordingly.
- 5.0.11. All gauge pins are to be of captive design where possible with negative return springs, otherwise fastened with key-bak chain or wire reel secured to the base with a Rockwell hardness of Rc = 54-56.
- 5.0.12. All tapered locating pins must have angles 5 – 10 degrees maximum and secure parts with taper running 10% undersize to 10% oversize relative to print hole sizes and tolerances.
- 5.0.13. All gauge pins are to be piloted into standard steel hardened bushings, slotted or square pins are to be guided by keys. Blind bushings must have air bleed holes. On pins smaller than 3mm that are not of captive design, pilot diameters must be the same as the pin diameter.
- 5.0.14. All checking fixtures are to be provided with GO – NO GO round (rod type) feelers for checking clearances for unexposed uncoated metal parts. E-coated metal parts and all plastic parts shall have spherical headed feelers pins to minimize potential scoring of the surface or removal of exterior finishes. All feeler pins are to be fastened to the base plate by means of key-bak or wire reel with appropriate color coded dot corresponding to checked surface coated wire.
- 5.0.15. All nominal net blocks and SPC set masters are to be ground hardened steel.
- 5.0.16. Automotive manufacturer's specifications on clearances and color codes must be adhered to.
- 5.0.17. Tiercon will specify place of SPC gauging where it is critical to control our process to meet customer requirements.
- 5.0.18. All indicators must have digital input, be shock resistant design, have bezel size of approximately 2 ¼ unless otherwise specified and must read accordance with body line reference system.
- 5.0.19. SPC bushings to be hardened steel, 9.5mm in diameter and clearance shall be afforded for a probe transducer to be inserted and extracted with an envelope size of 32mm x 32mm x 85mm.
- 5.0.20. A 31.0mm set block (nominal set master) with hardened 9.5mm bushing and zeroing surface to be affixed horizontal to the base plate or as required.
- 5.0.21. Indicators must be guarded where normal handling of part result in damage.
- 5.0.22. Manufacturing tolerances are according to attachment unless otherwise specified.
- 5.0.23. All checking fixtures must have Tiercon supplied identification, revision, Tiercon Asset Tag (provided by Tiercon) and color code plates attached. Tiercon code, latest customer part number and revision dates must be stamped on appropriate plate. Fixture gauge weight and dimensions must be stamped on the base plate.

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- 5.0.24. All gauges must be submitted with two copies of a complete inspection report and (ballooned) drawing itemizing each dimension relative to the inspection report. First report and drawing is to be given to Tiercon Corp. Quality Assurance. Second report and drawing is to be delivered to the Tool Engineering Department. If the inspection report is not submitted or is incomplete, you will be charged for Tiercon Corp. layout time to produce same.
- 5.0.25. All checking fixtures larger than 3 ft. sq. base area or heavier than 16kg must be mounted on a dolly of stable design with 4 hard rubber wheels of no less than 6" in diameter all of which are locking. Also, it must have a storage shelf underneath for storage purposes. Dolly is to be painted light blue with Tiercon code painted on the structure. Gauges less than 16kg shall be outfitted with 4 jig feet 1.5" in diameter and minimum of 0.44" in height. Working height of the dolly mounted gauge must be 38" to 40". All checking fixtures must have provisions for eye bolt lifting holes.
- 5.0.26. All checking fixtures must be secured safely on the fixture cart for safe transportation of the fixture. See Appendix: for example. Material of the bracket should be made of steel. If the fixture is 48 inches or less in length only two brackets is required. If the fixture is greater than 48 inches in length, than four brackets is required. Location of brackets can be seen in Appendix: Figure 7 & 8
- 5.0.27. All checking fixtures must have a strapping mechanism for safe transportation of the fixture fastened to the cart. See Appendix: Figure 9 & 10 for strapping mechanism recommendation. Quantity of 2 per fixture is required.
- 5.0.28. Clamps/Hinges should not overhang check fixture base plate in open position.
- 5.0.29. All checking fixture must prove to be GR&R capable to 10% of the prints tolerance. Design approval by Tiercon does not release the vendor from capability requirements.
- 5.0.30. Sight checks are to be machined and recessed in the body of the fixture. Trim-line checks are machined to the maximum trim-line tolerance limit and stepped to the minimum trim-line tolerance limit on all critical trim-lines. A critical trim-line is one that is identified on the drawing as a resistance spot welding flanges, a gas weld seam, a material edge where potential interference could occur if the trim-line exceeded the maximum limit or a trim-line identified as critical by Tiercon automotive at time of quote. Non critical trim-lines are machined to nominal.
- 5.0.31. A fixture use instruction sheet complete with itemized fixture sketch or photograph must be laminated and affixed to the fixture such that it can be clearly seen when using the fixture. All instructions must be in clear concise English and must include enough detail to ensure that the part can be properly checked by an average person. Where fixture base size is limited, an additional "billboard" may be mounted on the fixture, perpendicular to the fixture base.
- 5.0.32. All checking fixtures must have the following information recorded on labels:
- a) Customer's Part Number, Revision level and Tiercon code
 - b) Customer's Tool ID Number
 - c) Weight & Dimensions of the fixture including cart where applicable
 - d) Manufacturer's name, Job Number, and Telephone Number
 - e) "Property of General Motors" tag or other customer equivalent ownership tag
- 5.0.33. Details to be rotated out of position to facilitate easy loading of part. All clamps, rotating details, slides and hinge drop to be free of pinch points.
- 5.0.34. All checking fixtures is to be third party certified to ISO/IEC 17025 compliance. At completion of the job, design and certification reports is to be supplied electronically in the format of a CD.
- 5.0.35. Ordering materials including base plate and machining or fabrication of details not to commence until after design approval.

6.0 Tolerance

FIXTURE MFG. TOLERANCE

6.0.1. Locational

Net Pads/Pins/Bushings	+ .050 mm
Tooling Ball	+ .050 mm
Positional Pins/Bushings	+ .100 mm
Body Lines	+ .100 mm
Paint Trim Outline	+ .500 mm
Machine Trim Outline	+ .250 mm
Flush Check Surface	+ .250 mm
Designated Clearance Surface	+ .250 mm

6.0.2. Size

Attribute Pin	+ .010 mm
Positional Pin	+ .010 mm
Set Master	+ .010 mm


7.0 Safety

7.0.1. To avoid any accidents while the gauge is being used, gauge suppliers must take the necessary safety precaution to prevent these outcome. Here are the minimum safety requirements expected by Tiercon.

- Pinch points are not allowed. Use clamps that will avoid pinch points
- Remove all sharp edges and burrs
- Drop hinges should have a stopping mechanism to prevent it from opening all the way to avoid collision with the operator. Also, to prevent overhanging the perimeter of the fixture cart.

8.0 Ergonomics

8.0.1. Checking Fixtures/Gauges should be designed and built with good ergonomics within them. No unnecessary bending or twisting that will promote bad poster to the operator. Must be user friendly.

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Appendix:

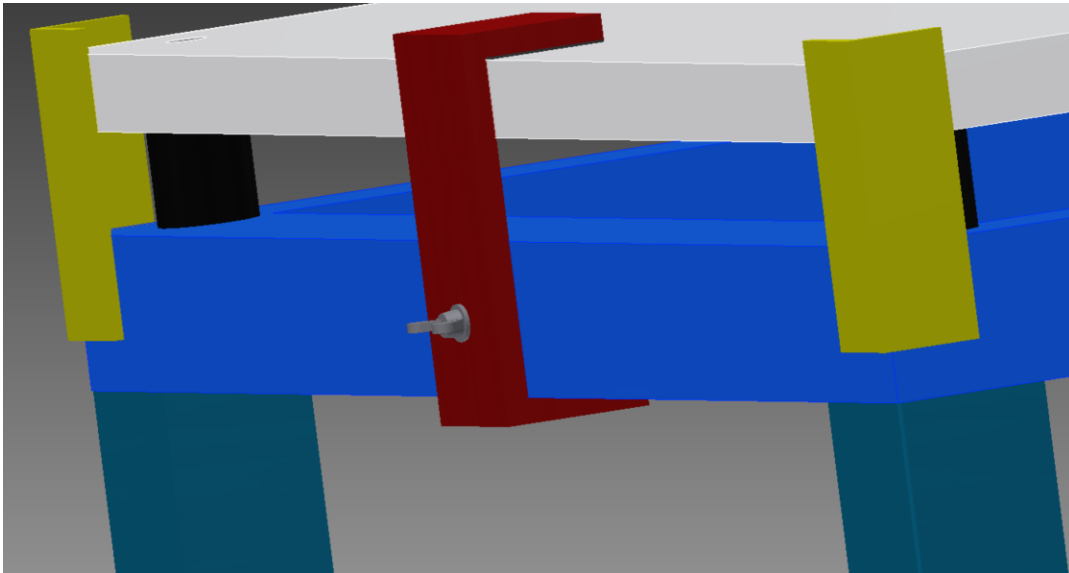


Figure 1: Locking Mechanism

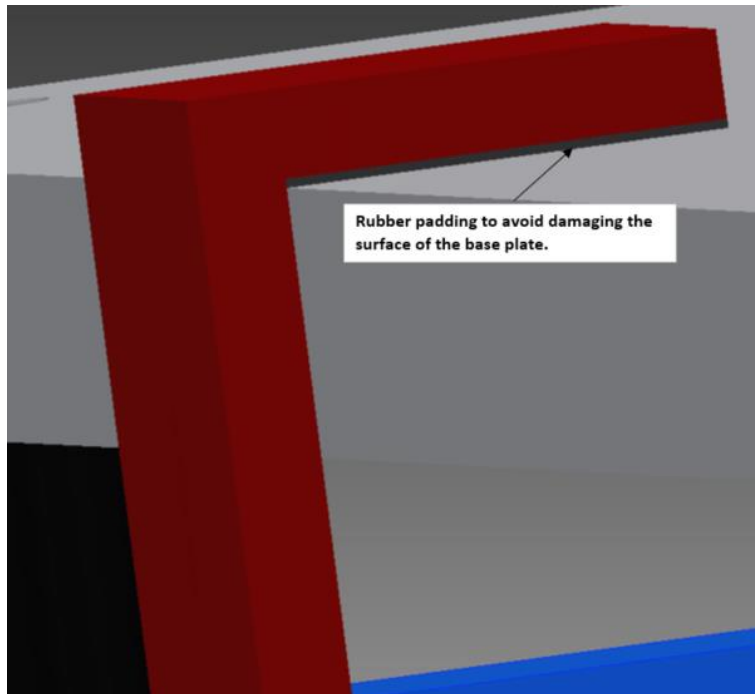


Figure 2: Rubber Padding



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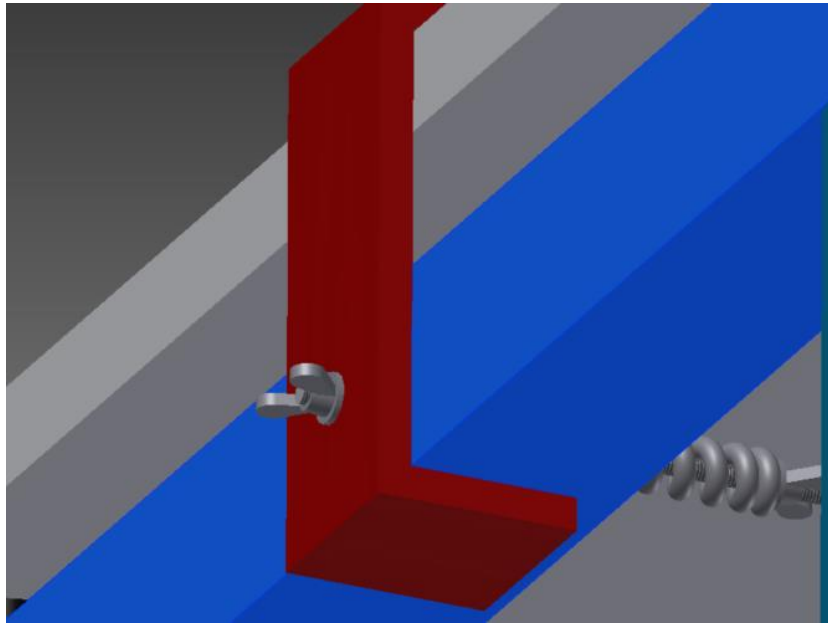


Figure 3: Lock Position

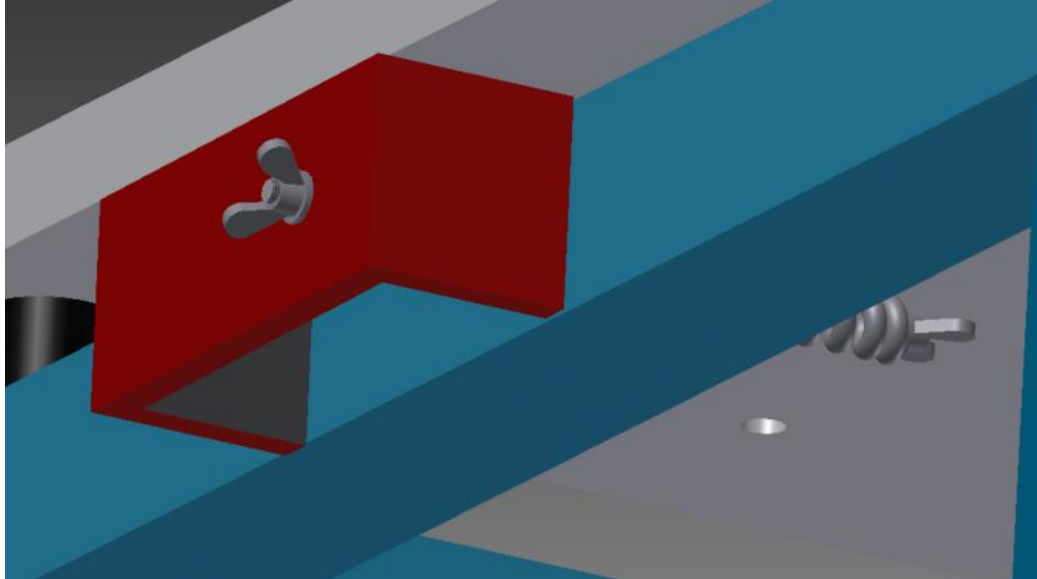


Figure 4: Unlock Position (Spring Loaded)



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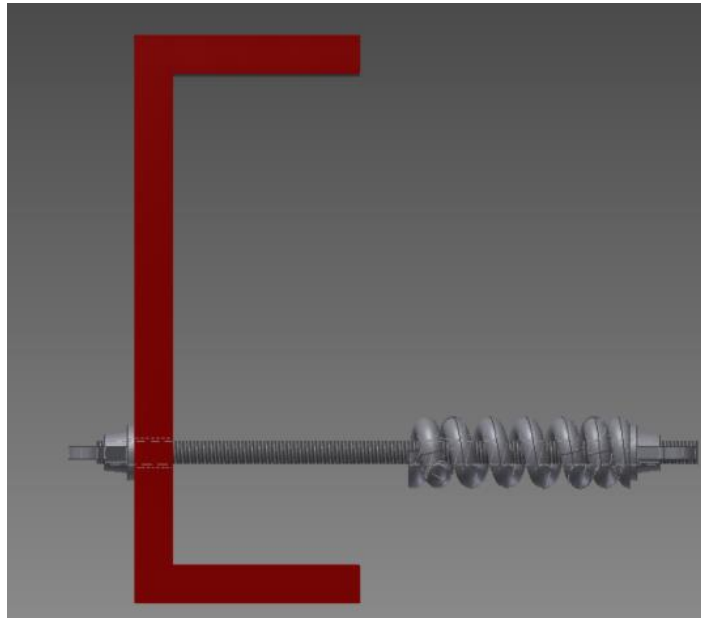


Figure 5 Bracket Side View

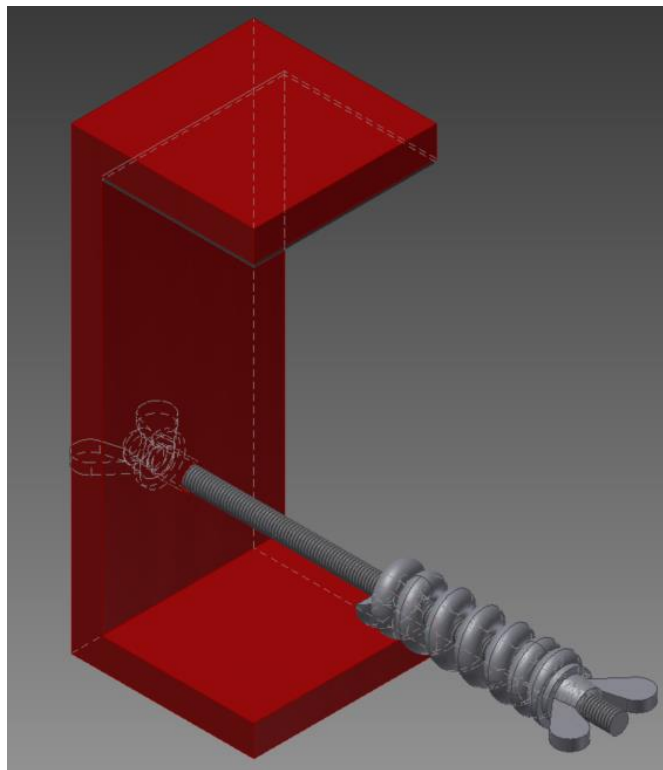


Figure 6 Bracket - ISO View



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Figure 7 Bracket Location – Fixture Base is 48 Inches or less in Length

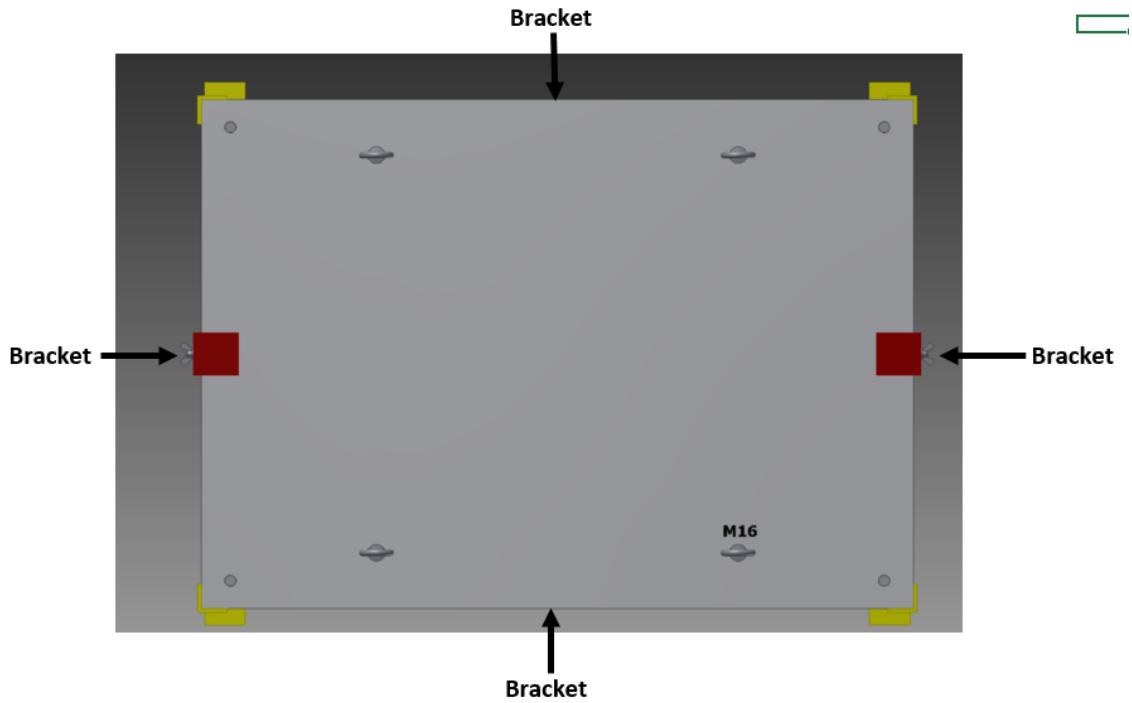



Figure 8 Bracket Location – Fixture Base is greater than 48 inches in length

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- **Company:** Midwest Precision Products, Inc, (MPP)
- **Product Number:** 2589
- **Description:** Custom 7046, Cargo King, 148" WL, Lock/Unlock Lever, Tightening ratchet, w/ attached 1875 E- Clip. (Custom product)



Figure 9 Strapping Mechanism

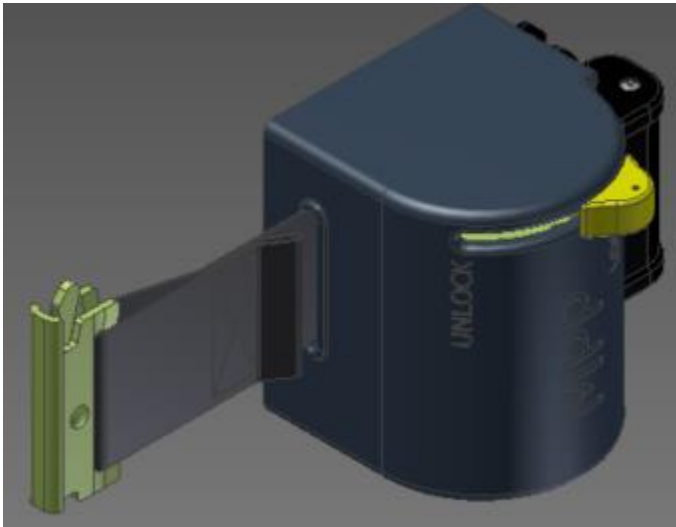



Figure 10 Strapping Mechanism - ISO View

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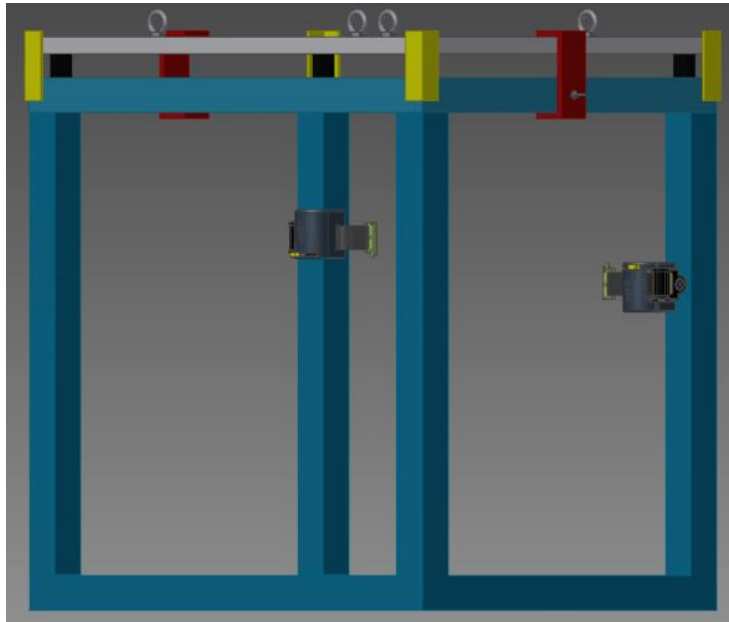


Figure 11 Recommended Location for Fastening Mechanism

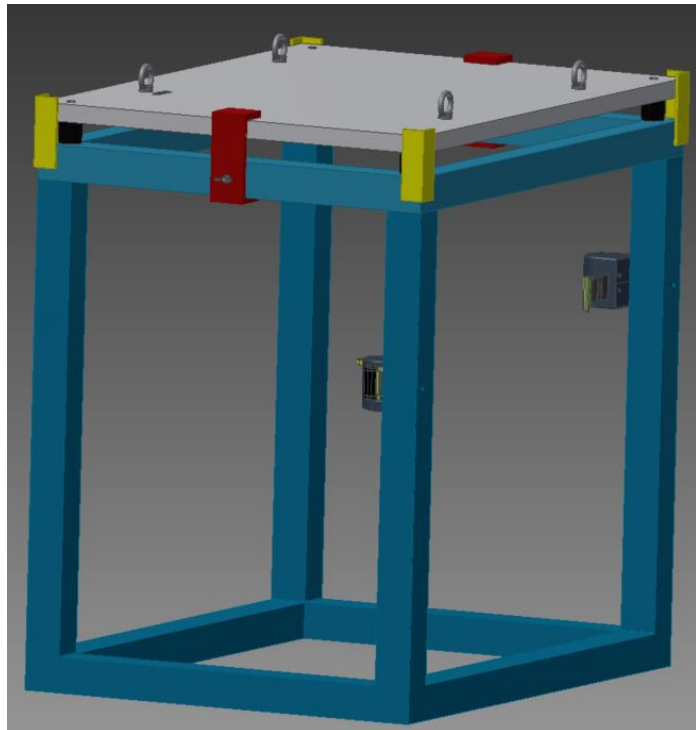


Figure 12 Recommended Location for Strapping Mechanism - Inside the Fixture Cart