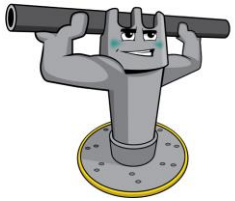
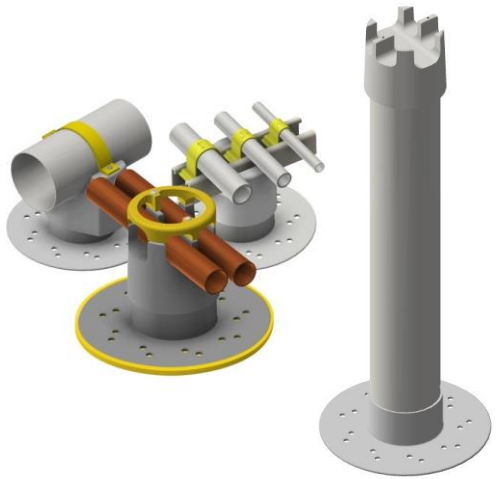
KnuckleHead Rooftop Support System for Mechanical Equipment

KNUCKLE UP!





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About GREEN LINK

GREEN LINK was established to discover innovative solutions to high-performance, more sustainable construction.

Our focus is designing and producing innovative polymeric architectural products, including the KnuckleHead Mechanical Rooftop Support System, which has been in the marketplace for over 10 years. Today we have an expanded product line to review.

We also manufacture specialty products for clean rooms and other controlled environments.

We work with contractors, architects, building owners and facility managers to engineer and produce the best possible solutions to meet the construction challenges of the 21st century.

The GREEN LINK TEAM

Our team is composed of personnel with a combined 150 years of roofing, mechanical design, custom manufacturing and/or contractor support experience.

Our staff includes chemical formulation, mechanical design, and technical support personnel, as well as operations, sales, marketing and customer service professionals.

We are a creative, agile group open to new ideas that will result in stronger, longer-lasting, more energy-efficient structures.

We seek dialogue with contractors, architects, materials engineers, product designers and project managers that can lead to new approaches for meeting the challenges of the 21st century.

GREEN LINK is located in Kalamazoo, Michigan and all products are produced in the USA.

What is the KnuckleHead Mechanical Rooftop Support System?

KnuckleHeads are tough, molded, fiberglass-reinforced nylon mechanical support units that keep pipes and equipment elevated to protect the roof's surface.

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Benefits

- The KnuckleHead Rooftop Support System keeps equipment high and dry
- Prevents damage caused by ponding water and ice
- Helps limit roof membrane tears
- Secures pipes and solar arrays in high wind or seismic conditions
- Helps prevent sagging, broken pipelines
- Provides enduring installations that contribute to building sustainability

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Why Use KnuckleHeads?

Wooden sleepers deteriorate from weather cycles.

Recycled rubber degrades due to UV exposure.

Ballast concrete blocks can dangerously point load the roof system.

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KnuckleHeads vs. Wooden Sleepers

Wooden Sleepers rot, but tough, reinforced nylon KnuckleHeads have been performing in the field for more than 10 years with constant exposure to high and low temperature extremes, freeze-thaw cycles, UV exposure and stress without showing signs of deterioration.

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KnuckleHead Composition

KnuckleHeads are custom molded from resilient, reinforced nylon which has excellent strength and weathering properties. The tensile strength of reinforced nylon is comparable to aluminum and is used as a replacement for metal in many applications.

KnuckleHeads are lightweight, so they add little to total roof load, but each unit can support up to 600 lbs.

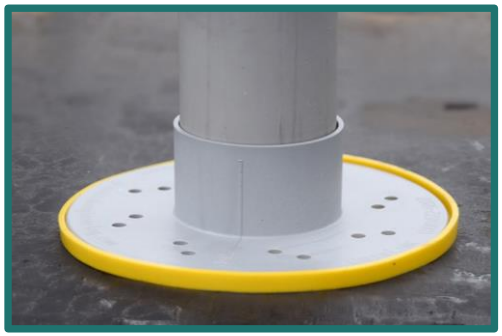
KnuckleHead Installation

KnuckleHeads can be loose laid, mechanically attached, bonded with adhesive, or attached using both mechanical fasteners and adhesive; target flashings, base pads and other accessories are available.

Key Design Feature: The Universal Base

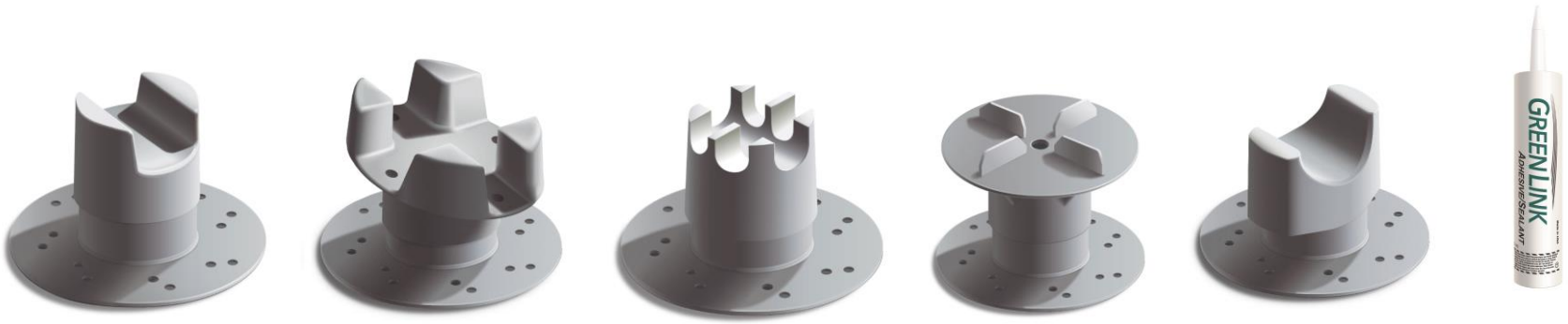
KnuckleHeads feature a Universal Base, 7 inches in diameter, providing 38.5 square inches of surface area that creates a stable foundation and evenly distributes load.

The Universal Base is the foundation of each unit.



The KnuckleHeads

There are currently 5 head options available in the KnuckleHead family, each designed for a specific application.



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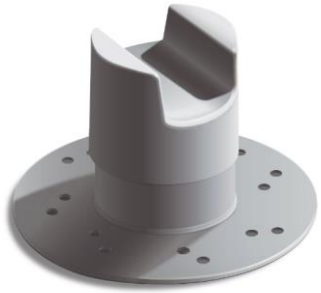

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Strut Support System

Strut Supports are designed to accommodate square steel channel, which in turn can be configured to support piping, mechanical equipment such as HVAC, air conditioners, multiple conduit units, extended metal walkways and solar arrays.

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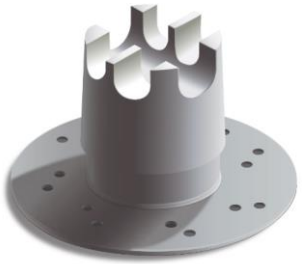

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Lite Pipe Support System

Lite Pipe Supports are commonly used for condensation pipes and electrical conduit. They are compatible with a single 1.315” outside diameter or two 0.840” outside diameter pipes.

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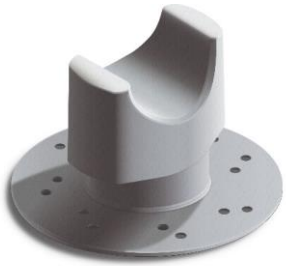

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Heavy Pipe Support System

Heavy Pipe KnuckleHeads can support pipes up to 3” outside diameter such as PVC, natural gas lines or water lines.

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Paver Support System

Paver supports are deployed to construct raised flooring that protects the roofing membrane and mechanical components from foot traffic.

They can be used with concrete paver tiles and composite decking to create access flooring, garden terraces and plaza decks.

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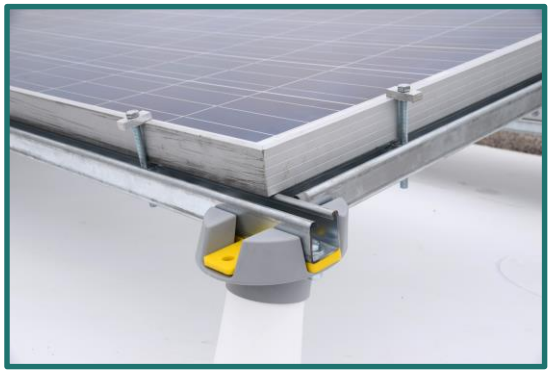
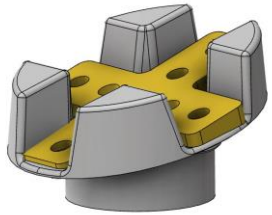
Solar Support System

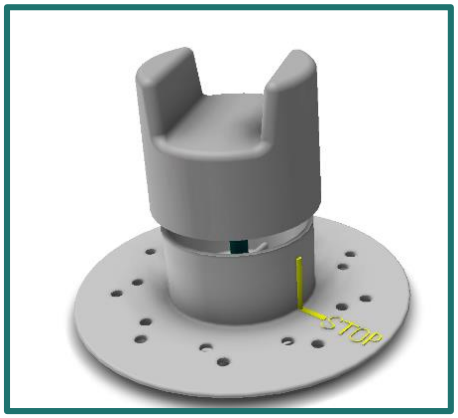


Solar KnuckleHeads provide an angled structure for roof-mounted solar panels. The head is designed to position framing up to 1⅝” at a fixed 15° angle for solar energy collection.

Each head is capable of resisting up to 750 lbs. of wind uplift force. A 5° SolarWedge is available for angle adjustment.



KnuckleHead Height Extensions



The height of each unit can be adjusted by rotating the head. The adjustment range is up to 1.5” in height depending on the type of head.

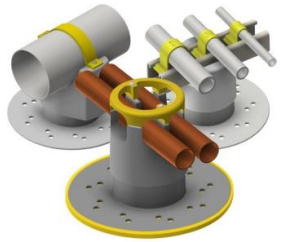
In heavy snowfall areas or where codes apply, a Universal Base Extension can elevate KnuckleHeads by 8”, 12” or 18” off the roof surface.

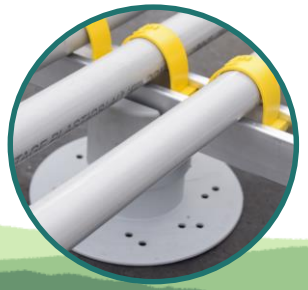
Custom height extensions can be ordered for your projects.

GREEN LINK Adhesive/Sealant

KnuckleHeads can be bonded directly to the roof membrane using solvent-free polyether *GREEN LINK* Adhesive/Sealant. It has been specially formulated to adhere to PVC, EPDM, TPO (with the use of a primer), and SBS Mod Bit, as well as the KnuckleHead base itself, which is composed of glass-reinforced nylon.

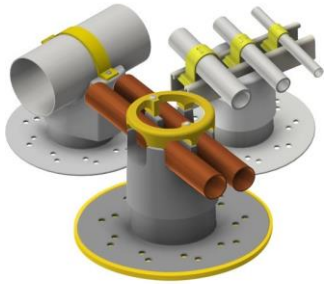
KnuckleStraps, KnuckleCaps and KnuckleClips





- To secure pipes in the KnuckleHeads, *GREEN LINK* offers custom-designed, safety-yellow pipe straps and cover rings molded from tough, weatherproof structural urethane. These will allow for expansion and contraction.
- The pipe KnuckleStrap is designed for Heavy Pipe KnuckleHeads and the cover ring – KnuckleCap – for Lite Pipe Supports. Both can be installed using self-tapping sheet metal screws.
- The strut strap for aluminum and steel channel slides in and snaps in place. No screws are needed.

KnucklePads



The slip-resistant KnucklePads are used to protect the roof membrane and minimize the effects of vibration.

KnucklePads may be required by the roofing manufacturer for warranty purposes.

The KnuckleHead Mechanical Support System - Key Points

- Features a universal 7” base
- Can also be loose laid, mechanically attached, bonded with ***GREEN LINK*** Adhesive/Sealant or both
- Offers 5 head options depending on application – **Lite Pipe, Heavy Pipe, Strut, Solar or Paver**
- Each head can support up to 600 lbs.
- Height adjustable
- Standard extensions of 8”, 12” and 18” are available as well as made to order for your needs
- Safety yellow KnuckleStraps, KnuckleCaps, KnuckleClips and roof protection KnucklePads are available
- Custom Manufacturing
- 10-year field exposure: no weathering or deterioration
- 10-year warranty available
- Made in the USA

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KnuckleHead Mechanical Support System

Case Studies

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CASE STUDY 1: REPLACING WOOD BLOCKS WITH THE KNUCKLEHEAD ROOFTOP SUPPORT SYSTEM

This project involved replacing wood blocks with KnuckleHead supports as part of a roof upgrade on a retail building in East Lansing, Michigan. The contractor had applied the Roof Restoration System of a major manufacturer of roofing materials—a two-coat liquid polyurethane coating—over an aging BUR. Installers had to work around dozens of deteriorating wood blocks, which had been used to support multiple steel gas lines and some electrical conduit coming from HVAC units.

CASE STUDY 1: REPLACING WOOD BLOCKS WITH THE KNUCKLEHEAD ROOFTOP SUPPORT SYSTEM

Following the completion of the topcoat, ***GREEN LINK*** personnel handled the removal of the blocks and the installation of the KnuckleHeads. Three types of KnuckleHeads were utilized: Heavy Pipe supports for 2 ½" steel gas line pipes, Lite Pipe KnuckleHeads for smaller lines ranging from ¾" to 1 ½" diameters, and Strut KnuckleHeads for steel channel, which supported pipeline clusters.

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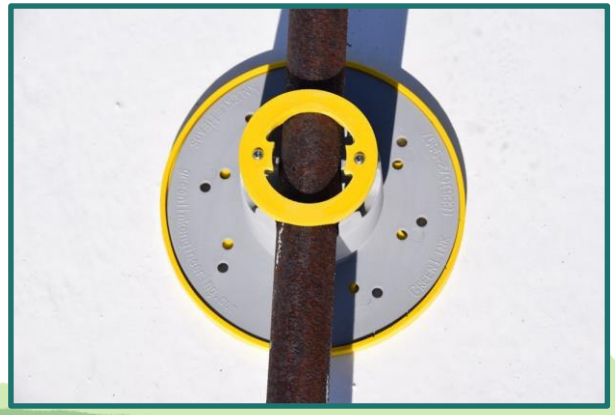
CASE STUDY 1: REPLACING WOOD BLOCKS WITH THE KNUCKLEHEAD ROOFTOP SUPPORT SYSTEM

BEFORE the installation

AFTER the installation

BEFORE the installation

AFTER the installation



CASE STUDY 2: REPLACING WOOD SLEEPERS ON LOW-SLOPE ROOF

This low-slope TPO roof on a public-school building in Michigan shows the flaws of using wood sleepers and the advantages of KnuckleHeads for pipe supports.

Loose-laid sleepers are subject to movement, over time causing pipes to bend and contort. In addition, the wood will deteriorate and rot from weathering and biological attack. In some cases, the rotting wood allows screws to loosen, causing brackets to detach so that they can no longer hold pipes in place.

CASE STUDY 2: REPLACING WOOD SLEEPERS ON LOW-SLOPE ROOF

This project involved replacing the sleepers with three types of KnuckleHeads. Heavy Pipe KnuckleHeads were used to support gas lines (black pipes). Strut Supports and Lite Pipe Supports were used for electrical conduit (light grey pipes), which powered multiple HVAC systems. Dual conduit lines were supported by aluminum channel set in Strut Supports while Lite Pipe Supports were used for elevating single lines.

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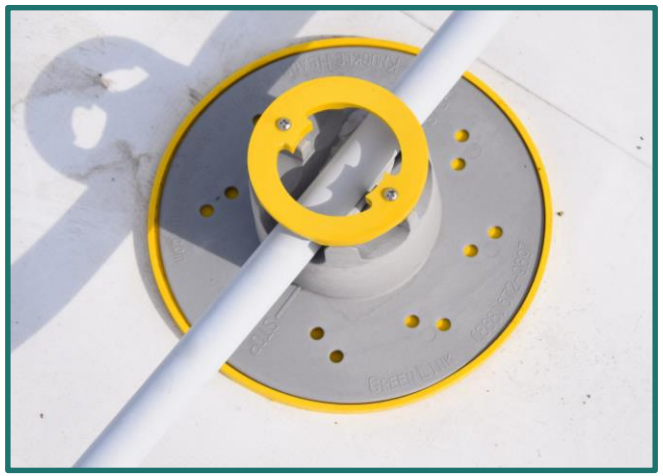
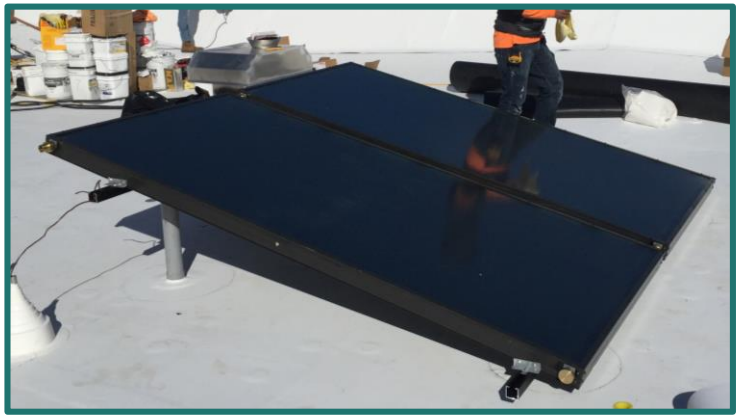
CASE STUDY 2: REPLACING WOOD SLEEPERS ON LOW-SLOPE ROOF



CASE STUDY 3: SOLAR INSTALLATION FEATURING THE PATCH METHOD

This project on a California gas station involved installation of solar thermal panels over an approximately 8,000-square-foot roof covered with TPO single-ply membrane. Strut KnuckleHeads and extensions supporting Unistrut were used to angle the panels at 15°.



The contractor applied ¼" screws to install the KnuckleHead bases. To prevent possible leaks caused by penetrating the membrane, the contractor first used a ***GREEN LINK*** adhesive/sealant to seal around the base, followed by the "patch method." Round sections, or "targets," cut from TPO membrane were placed over the base and heat-sealed around the edges to prevent possible leaks. The installation was approved by the building inspector.

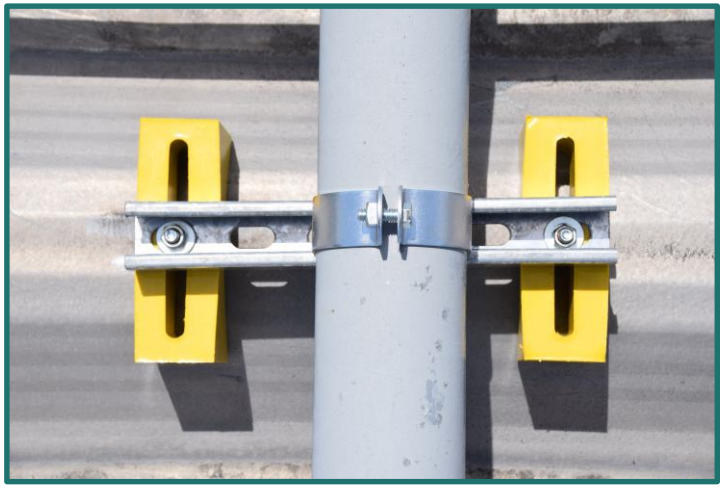
CASE STUDY 4: CUSTOM ENGINEERING OF KNUCKLEHEADS

This project involved a combination of standard KnuckleHead Lite Pipe, Heavy Pipe and Strut Supports along with GREEN LINK custom-molded products that were engineered to fit the specific demands of the roof structure. An airplane maintenance facility located in southwestern Michigan required replacement of its rooftop pipe system, which utilized wood sleepers of varying sizes. A section of the steel corrugated roof presented an unusual challenge.

BEFORE the installation

AFTER the installation

CASE STUDY 4: CUSTOM ENGINEERING OF KNUCKLEHEADS



Specially designed polyurethane saddles were custom molded by GREEN LINK to fit on top of the corrugated contours of the roof. One design accommodated steel strut for supporting multiple large pipes in a perpendicular configuration, while another design accommodated the Lite Pipe KnuckleHead for supporting smaller pipes. Additionally, a section of the roof featured a standard low-slope design. Here, standard Lite Pipe and Heavy Pipe KnuckleHead Supports with extensions and KnucklePads met the requirements of the job. Both Lite Pipe and Heavy Pipe supports were capped using KnuckleCaps and KnuckleStraps to secure pipes in place.

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CASE STUDY 4: CUSTOM ENGINEERING OF KNUCKLEHEADS

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