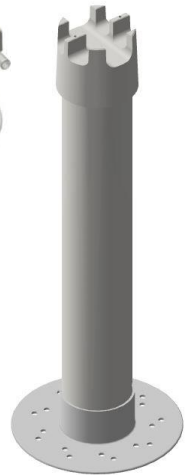
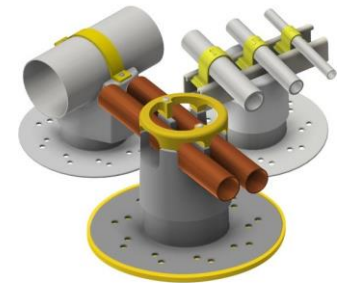


# *KnuckleHead*

## Support System



*GREEN LINK*  
ECO-ENGINEERING

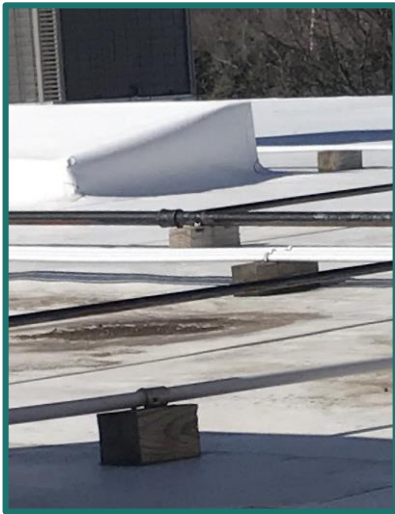


# WHY KNUCKLEHEADS?

- KnuckleHeads are tough, molded fiberglass-reinforced nylon mechanical support units that keep pipes and equipment elevated to protect the roof's surface.
- KnuckleHeads replace unsafe methods:
  - ✓ wooden sleepers which will deteriorate from weather cycles;
  - ✓ polypropylene supports that can't be stabilized using adhesive;
  - ✓ recycled rubber which degrades due to UV exposure;
  - ✓ concrete blocks which can dangerously increase roof load



# WHY KNUCKLEHEADS?



Wooden sleepers will deteriorate from weather cycles.



Recycled rubber degrades due to UV exposure.



Concrete blocks can dangerously increase roof load.



# *HALL OF SHAME*



# ***HALL OF SHAME***

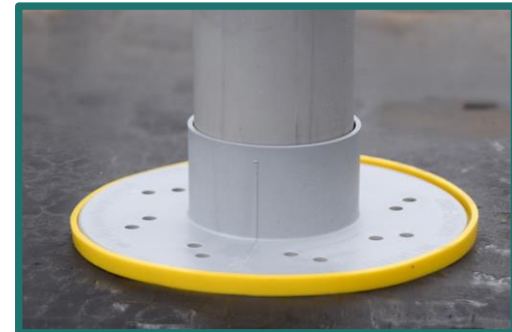


# *HALL OF SHAME*



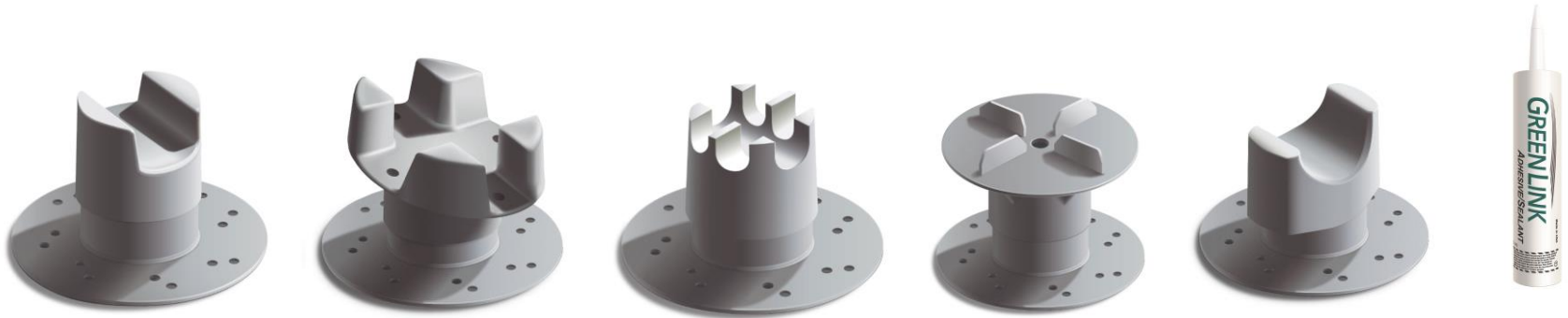
# ***THE UNIVERSAL BASE***

- KnuckleHeads feature a universal base, 7 inches in diameter.
- The base can be installed with mechanical fasteners, bonded with GREEN LINK Adhesive/Sealant or both. It can also be loose laid and a yellow roof protection pad can be used.
- Once the base is installed, a variety of head designs or 8", 12" and 18" extensions can be attached depending on the application.

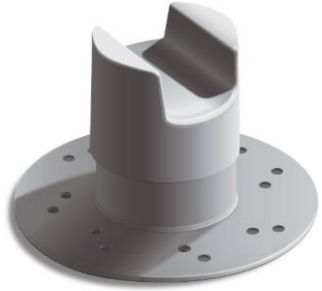


# ***THE HEADS***

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







# ***KnuckleHead***

## Strut Support System



- Strut Supports are designed to accommodate steel channel which in turn can be configured to support equipment such as air conditioners or multiple conduit units.



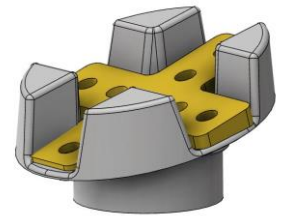


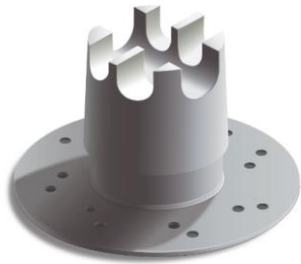
# KnuckleHead

## Solar Support System



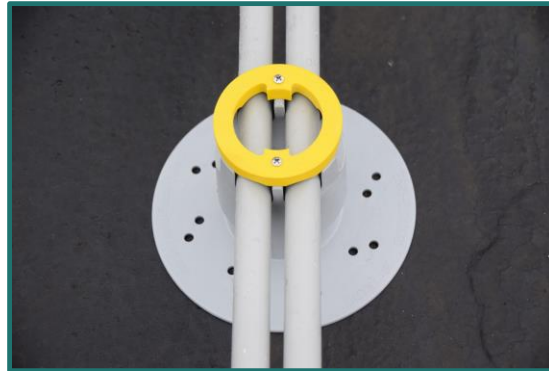
- Solar KnuckleHeads are engineered to accept standard strut framing to create 15 degree angled structures for solar energy collection. 5 degree SolarWedge allows for an angle adjustment.





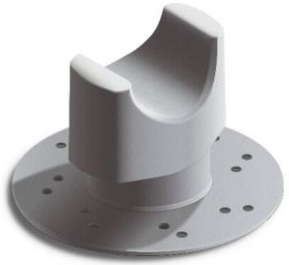
# ***KnuckleHead***

## Lite Pipe Support System



- Lite Pipe Supports are commonly used for condensation pipes and electrical conduit. They are compatible with a single 1" nominal pipe or two ½" nominal pipes.





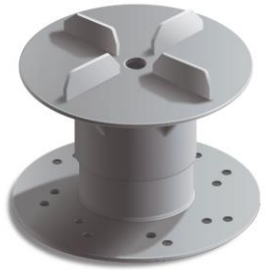
# *KnuckleHead*

## Heavy Pipe Support System



- Heavy Pipe KnuckleHeads can support pipes up to 3" in nominal size such as PVC or natural gas lines.





# ***KnuckleHead***

## Paver Support System



- Paver supports are designed to elevate pavers, ballast stone and walkways.



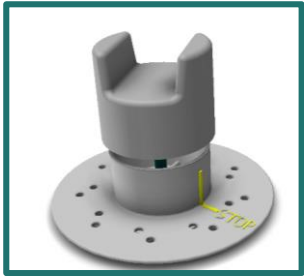
# ***GREEN LINK***

## ***Adhesive/Sealant***



- KnuckleHeads can be bonded directly to the roof membrane using GREEN LINK Adhesive/Sealant. It has been specially formulated to adhere to PVC, EPDM, TPO, and Mod Bit, as well as the KnuckleHead base itself, which is composed of glass-reinforced nylon. ChemLink M-1<sup>®</sup> Structural Adhesive/Sealant can also be used.

# ADJUSTMENT RANGE



- The height of each unit can be adjusted by rotating the heads. 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.



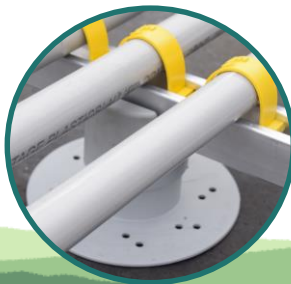
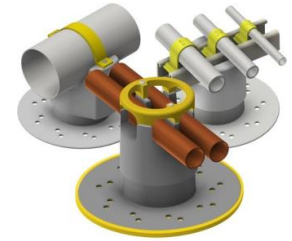
# ***KNUCKLEHEADS***



- Each KnuckleHead unit can carry up to 600 lbs. of load. Units can be spaced in such a way as to evenly distribute the load of the heaviest equipment.
- KnuckleHeads are lightweight but strong. They do not contribute significantly to total roof load.

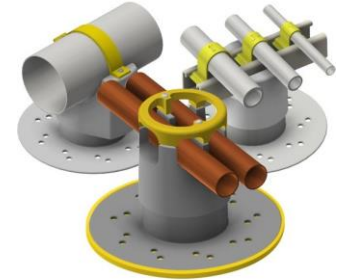


# *KnuckleStraps, KnuckleCaps and KnuckleKlips*



- To secure pipes firmly in KnuckleHeads, *GREEN LINK* offers custom designed safety yellow pipe straps and cover rings molded from tough, weatherproof structural urethane.
- 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. Choose KnuckleKlips!

# *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 warrantee purposes.



# *KnuckleHeads vs. Wooden Sleepers*



- KnuckleHeads have undergone 10 years of exposure in the field without showing signs of weathering or deterioration. 10-year warranty is available.



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



- This project involved replacing wood blocks with KnuckleHead supports as part of roof upgrade on a retail building in East Lansing, Michigan. The contractor had applied 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-inch 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.

# 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.



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



# ***PREVENTING LEAKS WHEN PENETRATING THE MEMBRANE***

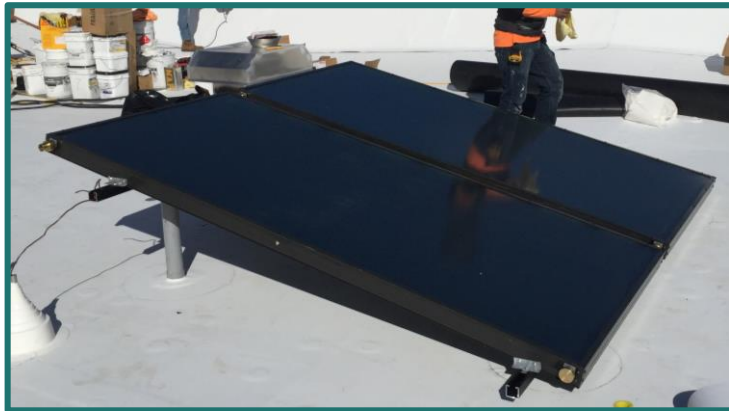


- When mechanical fasteners are used, a patch can be applied to ensure there are no leaks. First M-1<sup>®</sup> is used to bond and seal the base. Next a patch cut from the TPO Halo Target Flashing is placed around the KnuckleHead and heat welded in place.



## 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 Unistruts were used to angle the panels at a 15 degrees.



- The contractor applied 1/4-inch screws to install the KnuckleHead bases. To prevent possible leaks caused by penetrating the membrane, the contractor first used M-1 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.



## THE KNUCKLEHEAD SUPPORT SYSTEM – KEY POINTS

- Features a universal 7” base
- Can be mechanically attached, bonded with GREEN LINK Adhesive/Sealant or both. Can also be loose laid.
- Offers 4 head options depending on application – **Lite Pipe, Heavy Pipe, Strut, Solar or Paver**
- Each head can support up to 600 lbs.
- Height adjustable – 8”, 12” and 18” extensions are available
- Safety yellow KnuckleStraps, -Caps, -Klips and roof protection KnucklePads are available
- 10-year field exposure: no weathering or deterioration
- 10-year warranty available

# *THANK YOU!*





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