



**P**HP Systems and Design is the technological leader in the specialty of providing the solution to setting piping, equipment and walkways on any surface or roof system. With over 15 years spent on design, research, development and testing, the PHP Systems offer height adjustability, easy installation, increased load distribution, flexibility and on-site technical support. To date, this is the only system that does not violate the roofing manufacturer's warranty. Whether for new installations, modifications or retrofit, PHP provides assistance with the engineering and design for all their support systems. PHP will continue to set new standards with innovative product solutions and superior customer service.

Art Valentz  
President



# CORE VALUES

Our primary responsibility is to manage the company soundly, profitably and with adequate growth to serve the needs of our customers, our employees and our communities. In accomplishing our business purpose, we are guided by the following core values:

## **SATISFACTION**

is the ultimate focus of all our business activities.

## **INNOVATION**

is our way of life. Change is valued for the competitive opportunities it presents.

## **INTEGRITY**

is never compromised.

## **QUALITY**

in product, services and all of our business transactions is our first priority.

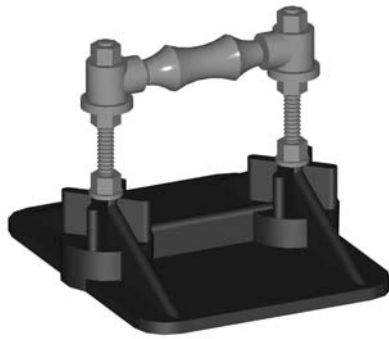
## **SERVICE**

for us is all about our commitment to the customer, before, during and after the sale. Our first order of business is keeping the customer happy, giving the customer value for their dollar and making sure they're pleased after the job is complete.

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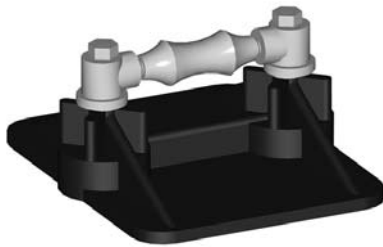
# PRODUCT CONTENTS



**SS-8-R (Super Sleeper System)**  
Height adjustable  
page 10



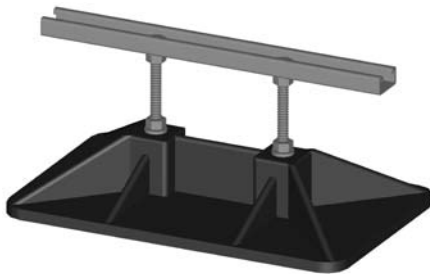
**SS-8-C (Super Sleeper System)**  
Height adjustable  
page 10



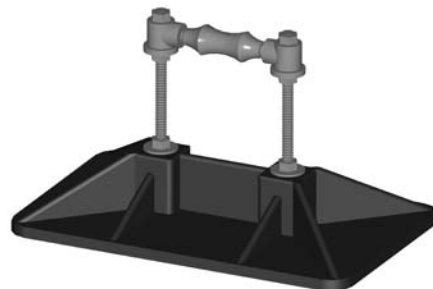
**SS-8-RL (Super Sleeper System)**  
Non-adjustable  
page 12



**SS-8-CL (Super Sleeper System)**  
Non-adjustable  
page 12



**PP10 with Channel**  
page 14



**PP10 with Roller**  
page 16

*PHP's products and methods relating to their use may be covered by one or more of the following U.S. patents, pending patent applications or foreign counterparts thereof: 5,217,191, 5,685,508, 2,193,575, 5,829,718, 583,199, 2,155,366, 2,313,741, 6,017,005, 1,003,812, 2,188,050, 2,092,370, D,435,430, 6,324,800B1, 92516, USSN,90/005,856 S,N, PCT/US/0042,516, D461,7025S, D,463,250S, 300946, 6,592,093B2*

# PRODUCT CONTENTS



**PP10 with Channel and Hanger**  
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**Type PS-1-2**  
page 20



**Type PSE-2-2**  
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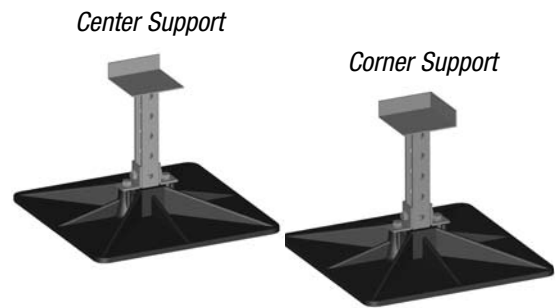
**Type PSE Custom**  
page 24

*PHP's products and methods relating to their use may be covered by one or more of the following U.S. patents, pending patent applications or foreign counterparts thereof: 5,217,191, 5,685,508, 2,193,575, 5,829,718, 583,199, 2,155,366, 2,313,741, 6,017,005, 1,003,812, 2,188,050, 2,092,370, D,435,430, 6,324,800B1, 92516, USSN,90/005,856 S,N, PCT/US/0042,516, D461,7025S, D,463,250S, 300946, 6,592,093B2*

# PRODUCT CONTENTS



**Type PPH-D (Duct/Cable Tray Support)**  
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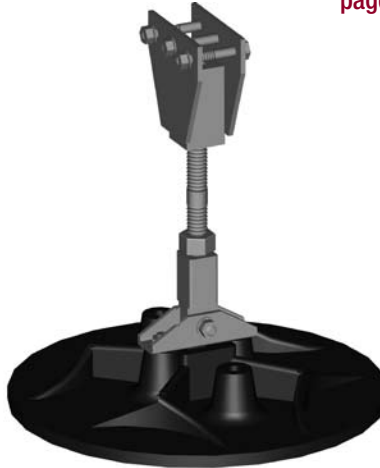
**RTU-20 (Equipment Support)**  
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**RB18 with Roller**  
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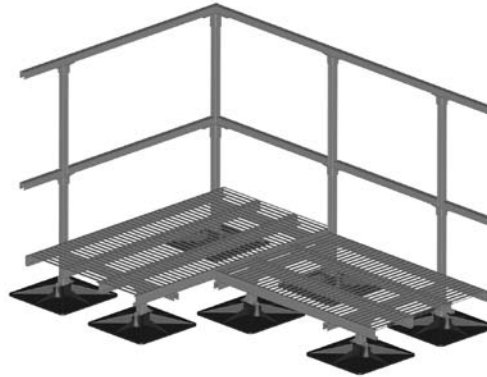
**RB18 with Swivel**  
page 38



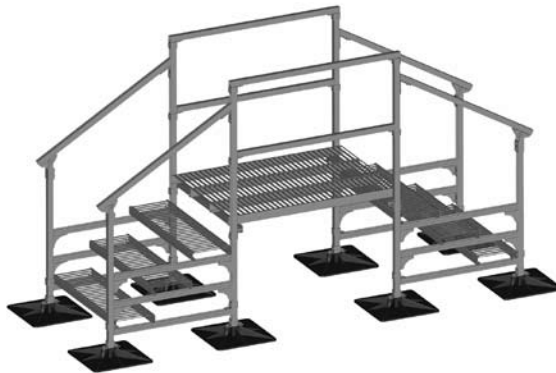
**RB18 with Leveling Assembly**  
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*PHP's products and methods relating to their use may be covered by one or more of the following U.S. patents, pending patent applications or foreign counterparts thereof: 5,217,191, 5,685,508, 2,193,575, 5,829,718, 5,83,199, 2,155,366, 2,313,741, 6,017,005, 1,003,812, 2,188,050, 2,092,370, D,435,430, 6,324,800B1, 9,2516, USSN,90/005,856 S,N, PCT/US/0042,516, D461,702S, D,463,250S, 300946, 6,592,093B2*

# PRODUCT CONTENTS



**Walkway System**  
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**Crossover System**  
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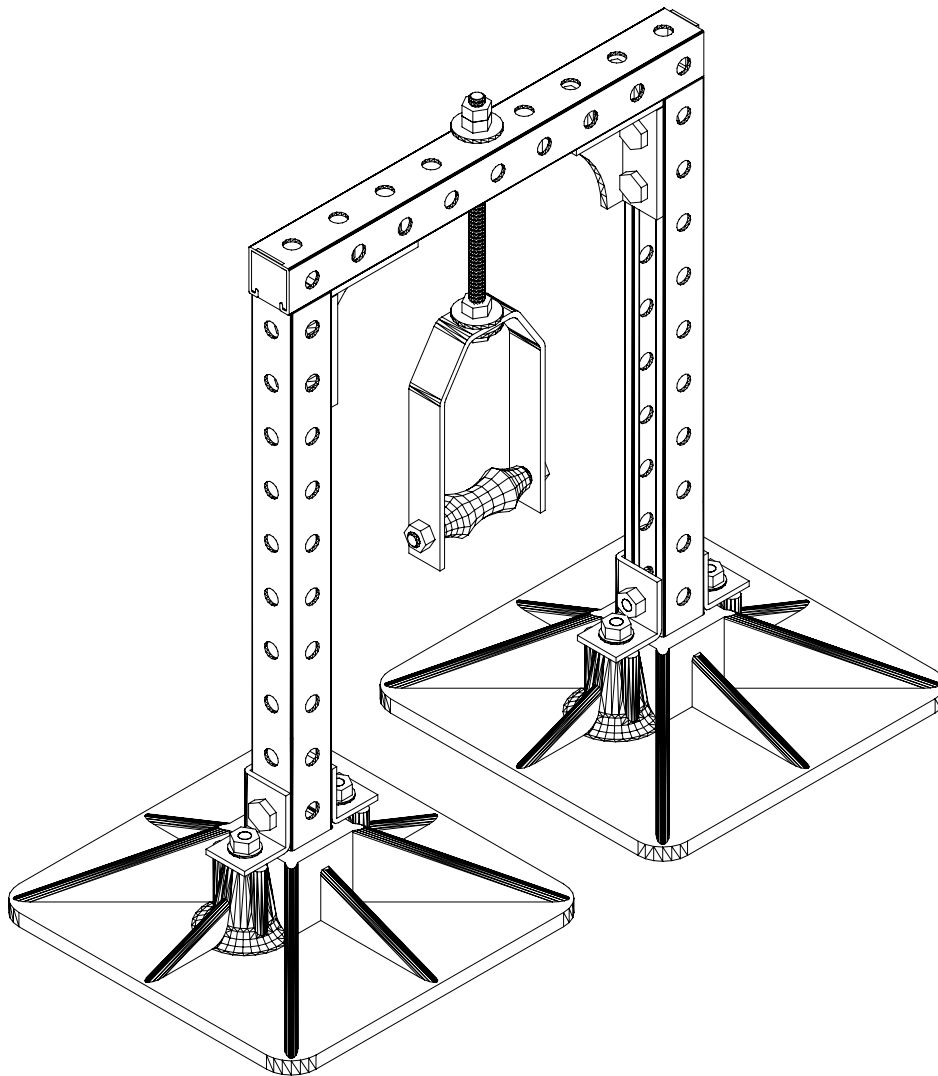
**Platform System**  
page 78

*PHP's products and methods relating to their use may be covered by one or more of the following U.S. patents, pending patent applications or foreign counterparts thereof: 5,217,191, 5,685,508, 2,193,575, 5,829,718, 583,199, 2,155,366, 2,313,741, 6,017,005, 1,003,812, 2,188,050, 2,092,370, D,435,430, 6,324,800B1, 92516, USSN,90/005,856 S,N, PCT/US/0042,516, D461,702S, D,463,250S, 300946, 6,592,093B2*





# PIPE SUPPORT SYSTEMS



# SUPER SLEEPER SYSTEMS

## Installation

1. All PHP Systems are pre-assembled (no field assembly).
2. Sweep off loose gravel, if present.
3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
4. After pads are installed, place bases on pads.
5. With all pipe supports in place, start at the beginning of the system and adjust each channel/roller to achieve a balanced system.

## Product Specifications

### SS-8-C

**Bases:** High Density Polypropylene Plastics & other additives for UV protection

**Weight:** Base with assembly 3 pounds

**Dimensions:** 8"x 10"x 2½"

**Height:** Adjustable

HDG or stainless steel threaded rods, nuts and washers

For pipe sizes ½" thru 2½"

### SS-8-R

**Bases:** High Density Polypropylene Plastics & other additives for UV protection

**Weight:** Base with assembly 4 pounds

**Dimensions:** 8"x 10"x 2½"

**Height:** Adjustable

HDG or stainless steel threaded rods, nuts and washers

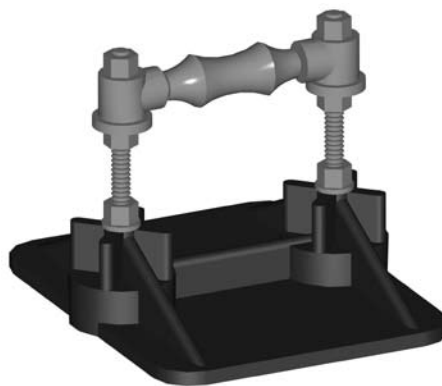
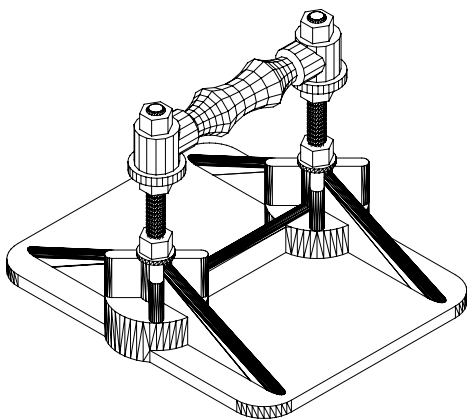
For pipe sizes up to 2½"

# SUPER SLEEPER SYSTEMS

## SS-8-R

Height adjustable

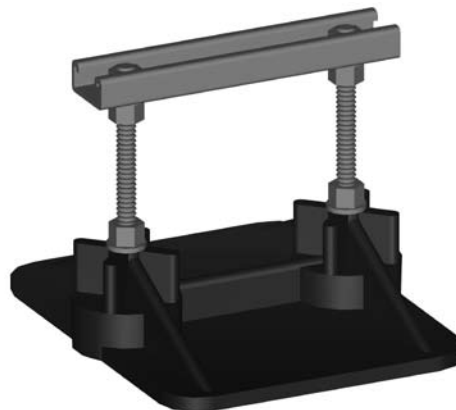
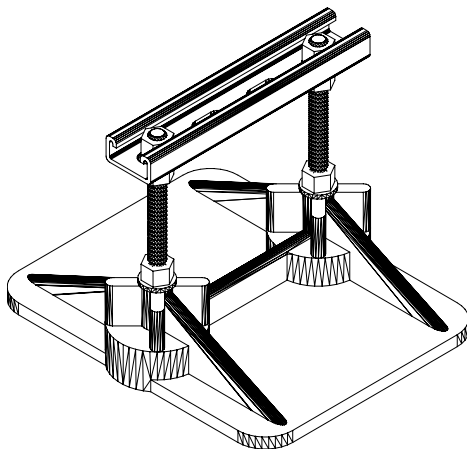
For pipe sizes up to 2½"



## SS-8-C

Height adjustable

For pipe sizes up to 2½"



**ORDER ON-LINE**

[www.portablepipehangers.com](http://www.portablepipehangers.com)

# SUPER SLEEPER SYSTEMS

## Installation

1. All PHP Systems are pre-assembled (no field assembly).
2. Sweep off loose gravel, if present.
3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
4. After pads are installed, place bases on pads.

## Product Specifications

### SS-8-CL

**Bases:** High Density Polypropylene Plastics & other additives for UV protection

**Weight:** Base with assembly 3 pounds

**Dimensions:** 8"x 10"x 2½"

**Height:** Non-adjustable 3¼" off roof

HDG or stainless steel threaded rods, nuts and washers

For pipe sizes ½" thru 2½"

### SS-8-RL

**Bases:** High Density Polypropylene Plastics & other additives for UV protection

**Weight:** Base with assembly 4 pounds

**Dimensions:** 8"x 10 x 2½"

**Height:** Non-adjustable 3¼" off roof

HDG or stainless steel threaded rods, nuts and washers

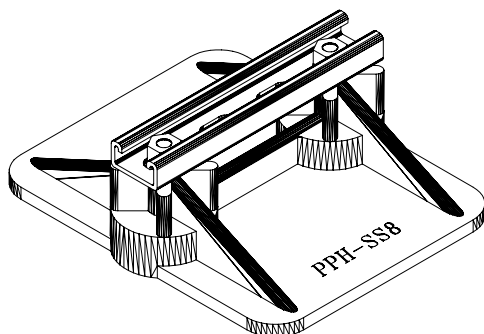
For pipe sizes up to 2½"

# SUPER SLEEPER SYSTEMS

## SS-8-CL

Non-adjustable

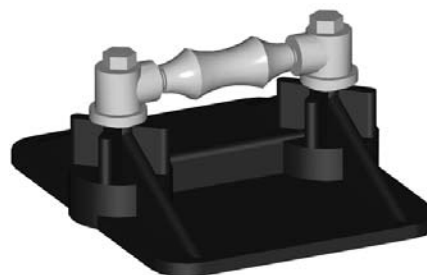
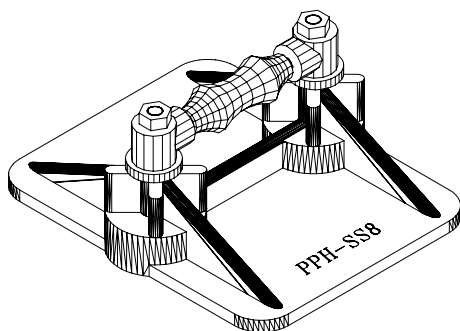
For pipe sizes up to 2½"



## SS-8-RL

Non-adjustable

For pipe sizes up to 2½"



**ORDER ON-LINE**

[www.portablepipehangers.com](http://www.portablepipehangers.com)

# TYPE PP10 WITH CHANNEL

## Installation

1. All PHP Systems are pre-assembled (no field assembly).
2. Sweep off loose gravel, if present.
3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
4. After pads are installed, place bases on pads.
5. With all pipe supports in place, start at the beginning of the system and adjust each channel to achieve a balanced system.

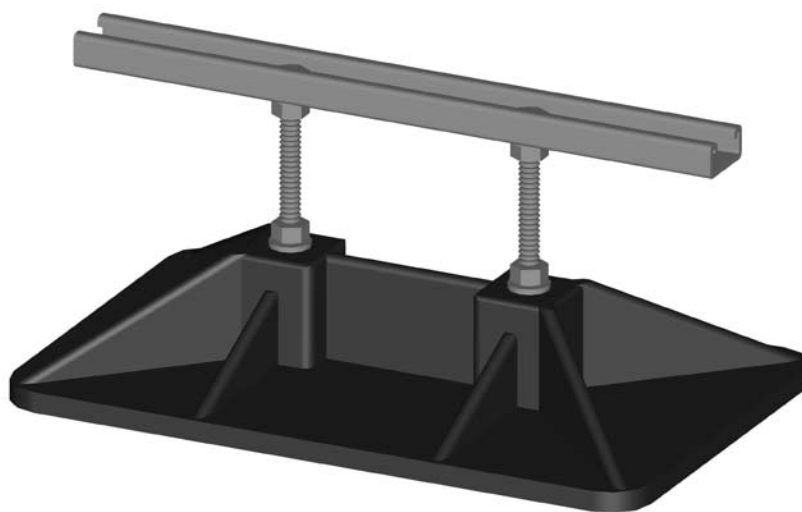
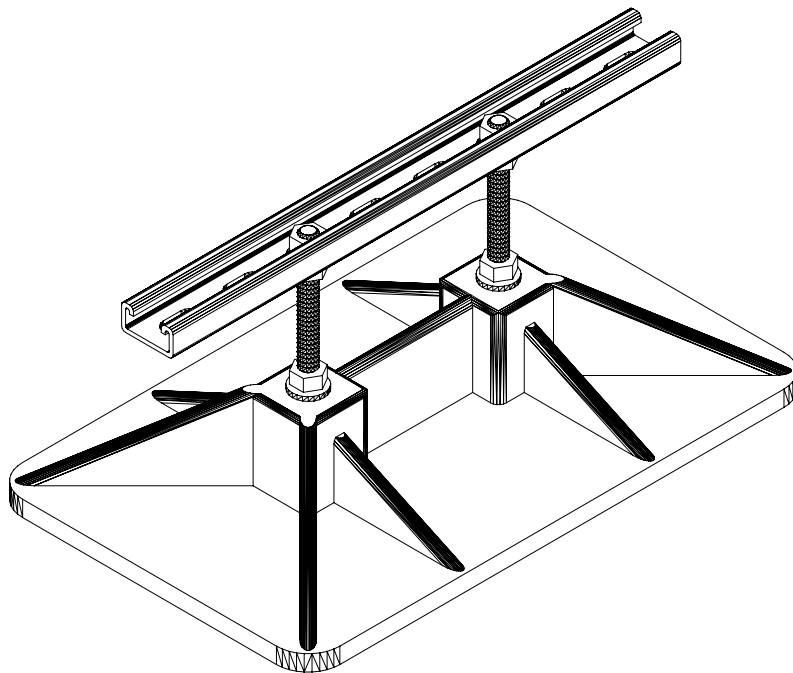
## Product Specifications

Bases:	High Density Polypropylene Plastics & other additives for UV protection
Weight:	Base with assembly 5.5 pounds
Dimensions:	10" x 16" x 3"
Height:	Adjustable

HDG or stainless steel threaded rods, nuts and washers

For pipe sizes ½" thru 3½"

## TYPE PP10 WITH CHANNEL



**For 3½" and Smaller Conduit Lines**

# TYPE PP10 WITH ROLLER

## Installation

1. All PHP Systems are pre-assembled (no field assembly).
2. Sweep off loose gravel, if present.
3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
4. After pads are installed, place bases on pads.
5. With all pipe supports in place, start at the beginning of the system and adjust each roller to achieve a balanced system.

## Product Specifications

**Bases:** High Density Polypropylene Plastics & other additives for UV protection

**Weight:** Base with assembly 6.5 pounds

**Dimensions:** 10" x 16" x 3"

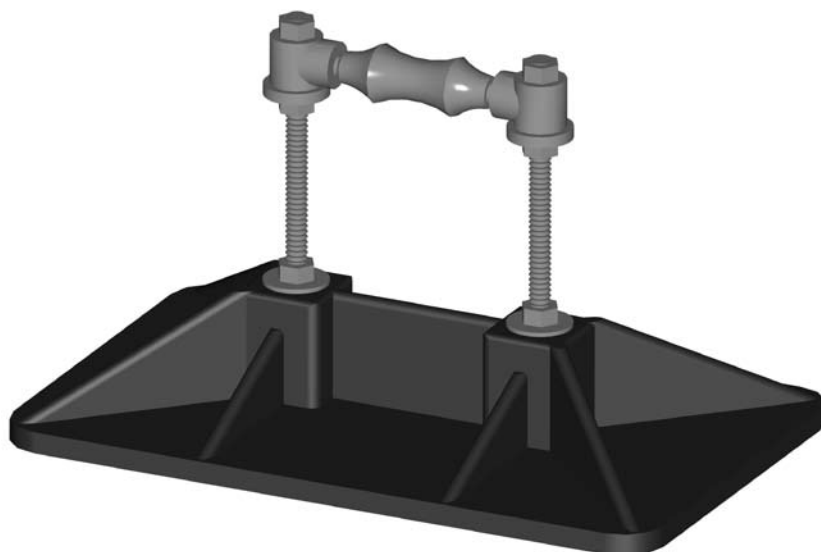
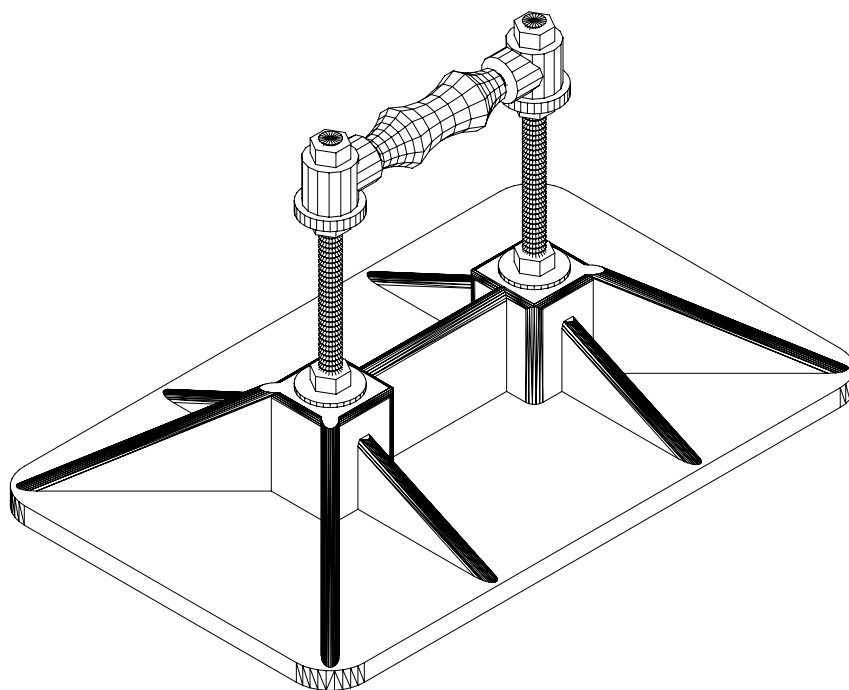
**Height:** Adjustable

HDG or Stainless steel threaded rods, nuts and washers

For pipe sizes ½" thru 3½"



## TYPE PP10 WITH ROLLER



**For 3½" and Smaller Gas Lines**

# PP10 WITH CHANNEL AND HANGER

## Installation

1. All PHP Systems are pre-assembled (no field assembly).
2. Sweep off loose gravel, if present.
3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
4. After pads are installed, place bases on pads.
5. With all pipe supports in place, start at the beginning of the system and adjust each hanger to achieve a balanced system.

## Product Specifications

**Bases:** High Density Polypropylene Plastics & other additives for UV protection

**Weight:** Base with assembly 6 pounds

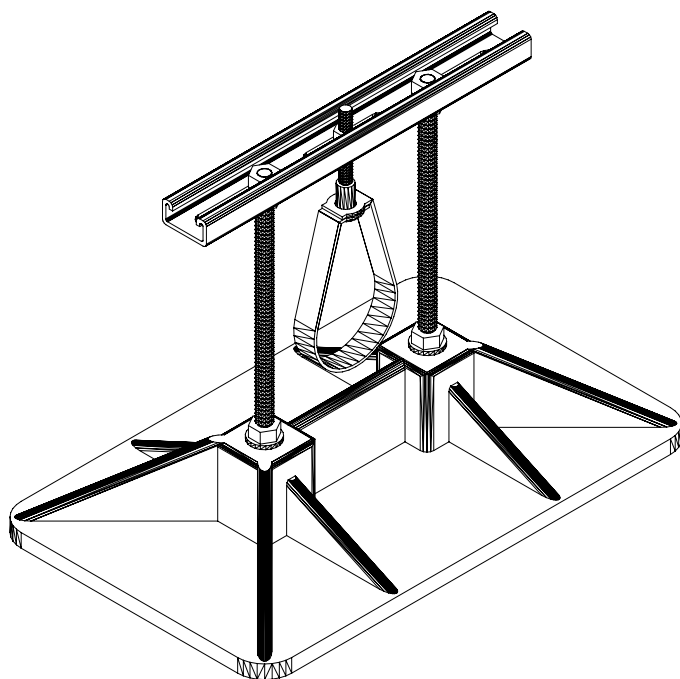
**Dimensions:** 10" x 16" x 3"

**Height:** Adjustable

HDG or stainless steel threaded rods, nuts and washers

For pipe sizes 3" and smaller

# PP10 WITH CHANNEL AND HANGER



**For 3" and Smaller Conduit and Gas Lines**

# TYPE PS-1-2

## Installation

1. All PHP Systems are pre-assembled (no field assembly).
2. Sweep off loose gravel, if present.
3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
4. After pads are installed, place bases on pads.
5. Place frames over pipe to be supported, then insert into bases.
6. Secure pipe in hangers and adjust.
7. With all pipe supports in place, start at the beginning of the system and adjust each hanger to its desired height. This process should be done in stages, raising the pipe approximately  $\frac{1}{2}$ " at a time. When desired height is reached, check each support to determine if an equal amount of weight is being distributed on each support.

## Product Specifications

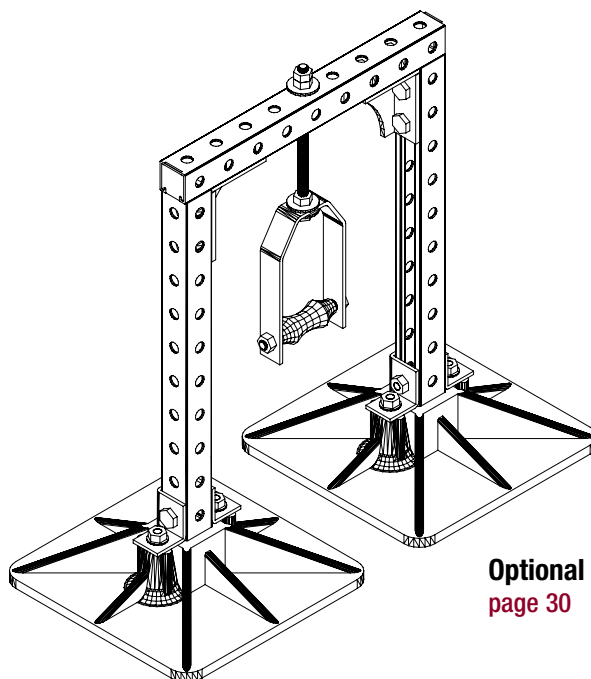
Bases:	High Density Polypropylene Plastics & other additives for UV protection
Weight:	Bases, 3 pounds each
Dimensions:	12" x 12" x 3"
Frames:	Manufactured from B22TH 1 $\frac{5}{8}$ " channel
Hanger Height:	Adjustable

HDG or stainless steel threaded rods, nuts and washers

Hot dipped galvanized roller, clevis or band hangers as specified

For pipe sizes 4" and larger

# TYPE PS-1-2



**Optional Accessories**  
page 30



**For 3½" and Larger Pipe Sizes  
Including Gas, Electrical and HVAC**

# TYPE PSE-2-2

## Installation

1. All PHP Systems are pre-assembled (no field assembly).
2. Sweep off loose gravel, if present.
3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
4. After isolation pads are installed, place bases on pads.
5. Place hanger over pipe to be supported, then insert into bases.
6. Secure pipe in hanger and adjust.
7. With all pipe supports in place, start at the beginning of the system and adjust each hanger to desired height. This process should be done in stages, raising the pipe approximately  $\frac{1}{2}$ " at a time. When desired height is reached, check each support to determine if an equal amount of weight is being distributed on each support.
8. The PSE-Custom frames telescope up and down for maximum flexibility.

## Product Specifications

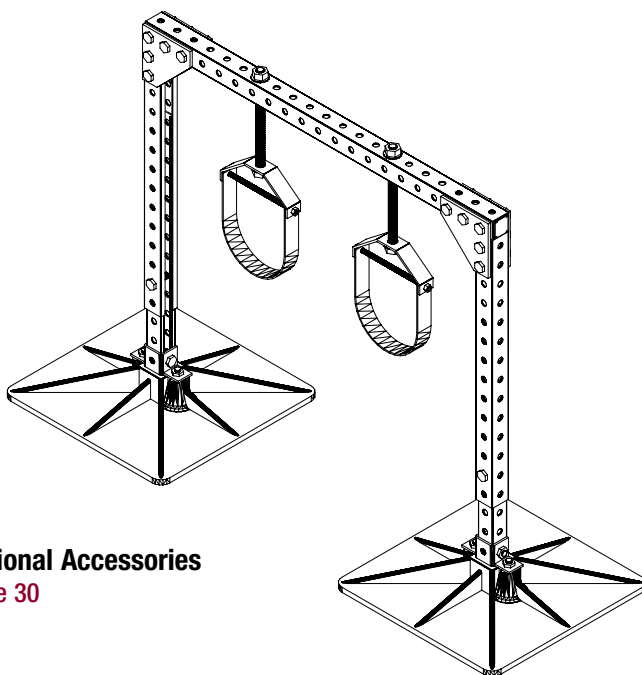
Bases:	High Density Polypropylene Plastics & other additives for UV protection
Weight:	Bases, 7 pounds each
Dimensions:	18" x 18" x 3"
Frames:	Manufactured from $1\frac{5}{8}$ " B22TH channel and $1\frac{7}{8}$ " BTS22TH channel .125-.250W when telescoped

HDG or stainless steel threaded rods, nuts and washers

Hot dipped galvanized roller, clevis or band hangers as specified

For pipe sizes  $3\frac{1}{2}$ " and larger (bare or insulated)

## TYPE PSE-2-2



**Optional Accessories**  
page 30



**For 3½" and Larger Pipe Sizes Including Gas, Electrical and HVAC  
(Bare or Insulated)**

*Custom support to accommodate all multiple pipe runs.*

# TYPE PSE-CUSTOM

## Installation

1. All PHP Systems are pre-assembled (no field assembly).
2. Sweep off loose gravel, if present.
3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
4. After isolation pads are installed, place bases on pads.
5. Place hanger over pipe to be supported and insert into bases.
6. Secure pipe in hanger and adjust.
7. With all pipe supports in place, start at the beginning of the system and adjust each hanger to desired height. This process should be done in stages, raising the pipe approximately ½" at a time. When desired height is reached, check each support to determine if an equal amount of weight is being distributed on each support.
8. The PSE-Custom frames telescope up and down for maximum flexibility.

## Product Specifications

Bases:	High Density Polypropylene Plastics & other additives for UV protection
Weight:	Bases, 7 pounds each
Dimensions:	18" x 18" x 3"
Frames:	Manufactured from 1½" B22TH channel and 1⅞" BTS22TH channel .125-.250W when telescoped

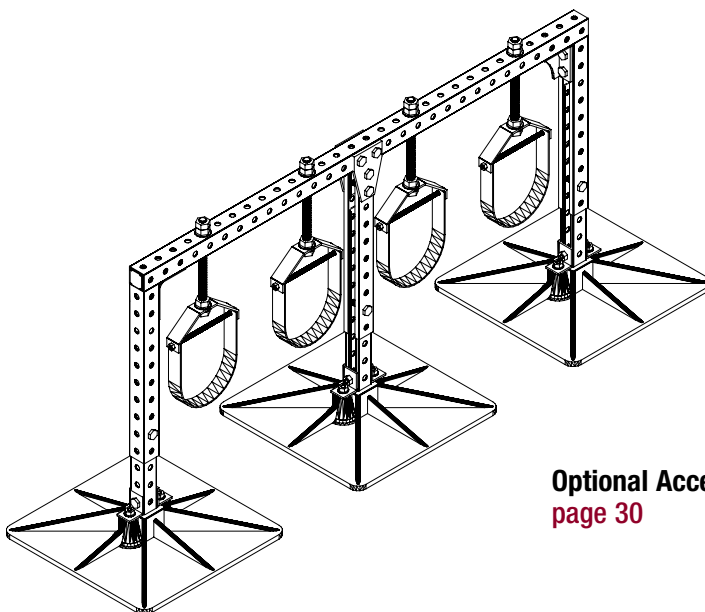
HDG or stainless steel threaded rods, nuts and washers

Hot dipped galvanized roller, clevis or band hangers as specified

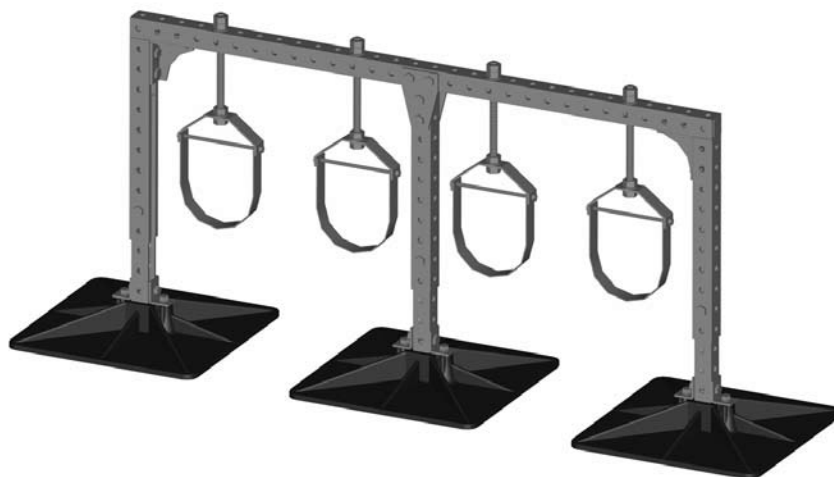
For pipe sizes 3½" and larger (bare or insulated)



# TYPE PSE-CUSTOM



Optional Accessories  
page 30



## PSE-4-3

**For 3½" and Larger Pipe Sizes Including Gas, Electrical  
and HVAC (Bare or Insulated)**

*Custom support to accommodate all multiple pipe runs. Third leg applicable when  
frame width exceeds 48" or deflection is .125" or greater.*

# PPH-D

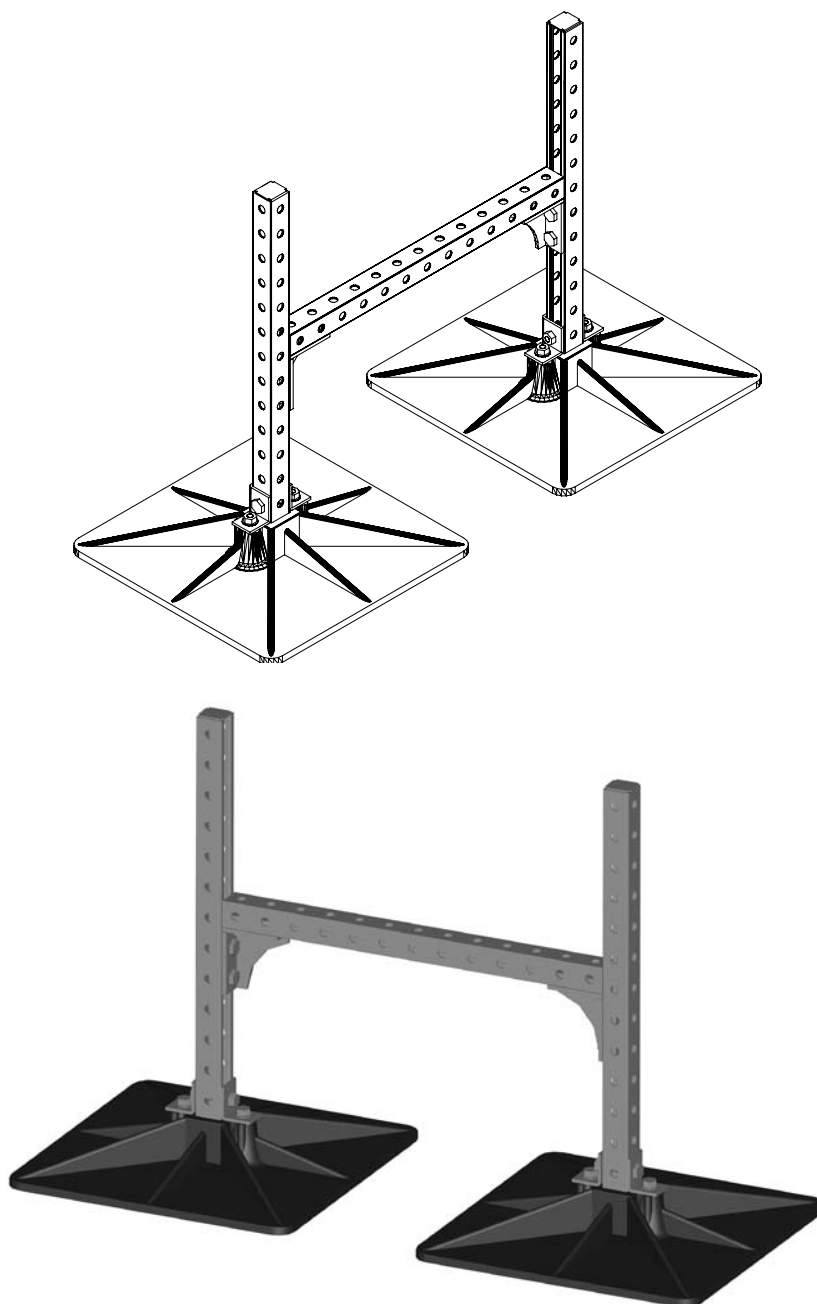
## Installation

1. All PHP Systems are pre-assembled (no field assembly).
  2. Sweep off loose gravel, if present.
  3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
  4. Determine spacing of supports.
  5. Fully adhere isolation pads to roof system if required.
  6. After pads are installed, place bases on pads.
  7. Place pre-assembled support into bases and adjust as needed.
- Note: Support shall be adjustable to maintain existing elevation and slope.

## Product Specifications

Bases:	High Density Polypropylene Plastics & other additives for UV protection
Weight:	Bases, 7 pounds each
Dimensions:	18" x 18" x 3"
Frames:	Manufactured from 1½" B22TH channel and 1⅞" BTS22TH channel .125-.250W when telescoped
HDG or stainless steel threaded rods, nuts and washers	

# PPH-D



**For Duct Sizes 12" x 12" and Larger**

*Supports for round ducting and cable tray are also available upon request.*

# RTU-20

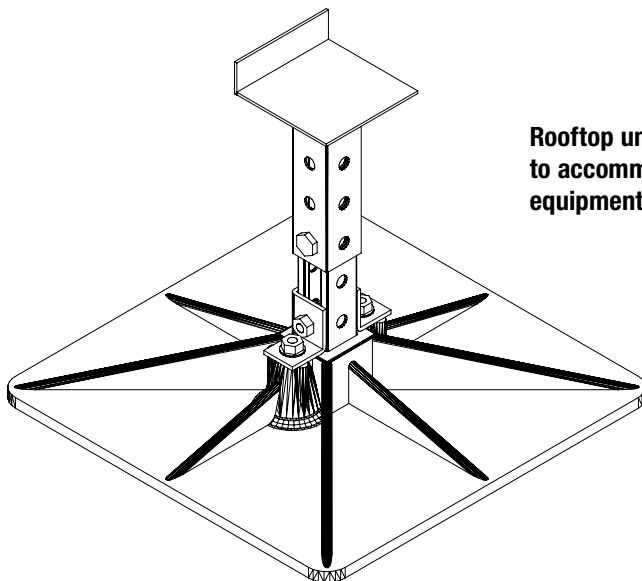
## Installation

1. All PHP Systems are pre-assembled (no field assembly).
  2. Sweep off loose gravel, if present.
  3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
  4. Determine spacing of supports.
  5. Fully adhere isolation pads to roof system if required.
  6. After pads are installed, place bases on pads.
  7. Place pre-assembled support into bases and adjust as needed.
- Note: Support shall be adjustable to maintain existing elevation and slope.

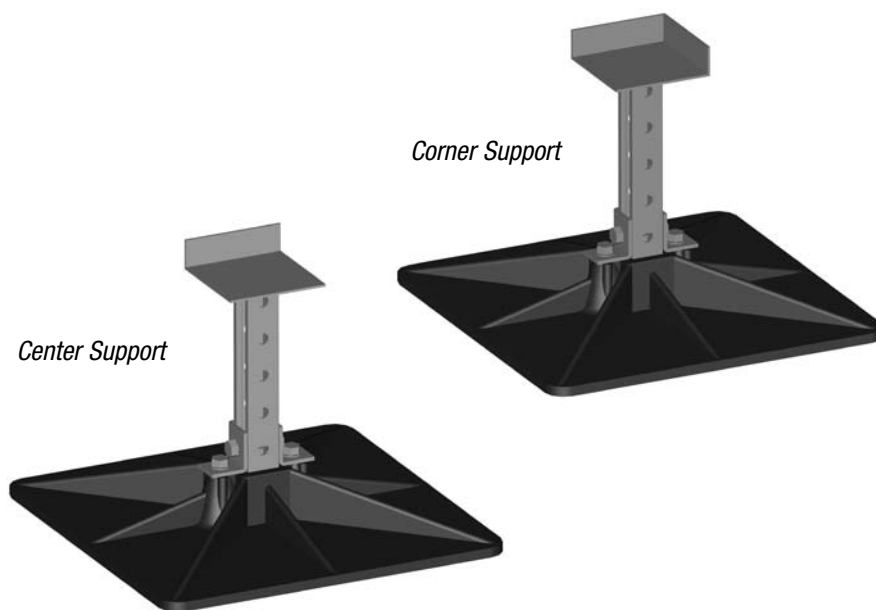
## Product Specifications

Bases:	High Density Polypropylene Plastics & other additives for UV protection
Weight:	Bases, 7 pounds each
Dimensions:	18" x 18" x 3"
Frames:	Manufactured from 1½" B22TH channel and 1½" BTS22TH channel .125-.250W when telescoped
HDG or stainless steel threaded rods, nuts and washers	

# RTU-20



**Rooftop unit supports  
to accommodate multiple  
equipment applications.**



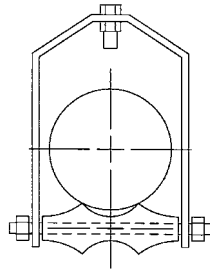
*Center Support*

*Corner Support*

# OPTIONAL ACCESSORIES

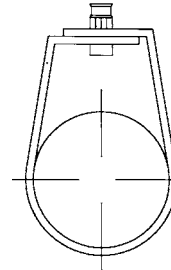
## Roller Hanger

Roller Hanger for use with  
Gas and other bare pipes



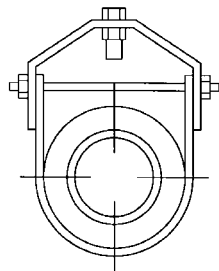
## Band Hanger

Band Hanger for use with  
HVAC and other insulated pipes



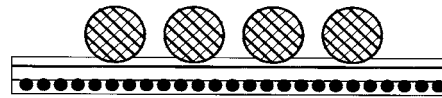
## Clevis Hanger

Clevis Hanger for use with  
HVAC and other insulated pipes



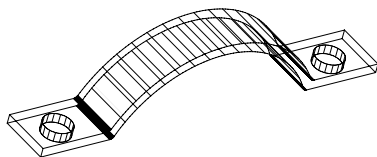
## Accessory Bar

Accessory Bar for use with Conduit  
or Cable under 2½" in diameter



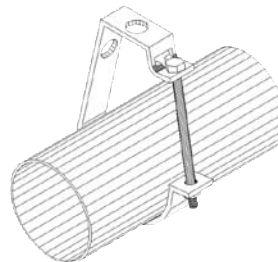
## Pipe Guide

Pipe Guide for use with PP10 & SS8  
units with roller assembly



## J-Clamp

J-Clamp for 2" and  
smaller conduit line

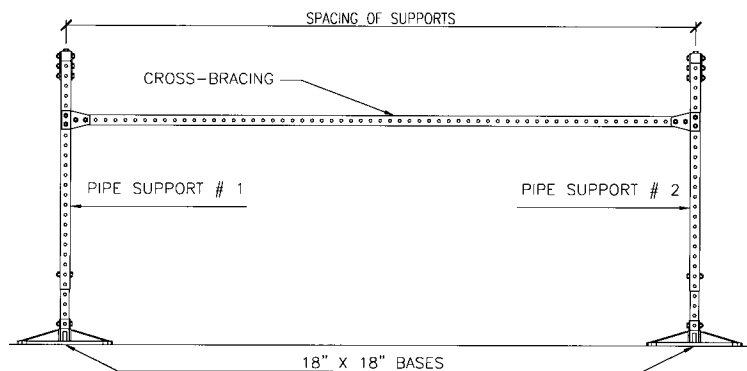


**For PS and PSE Custom Supports**

# OPTIONAL ACCESSORIES

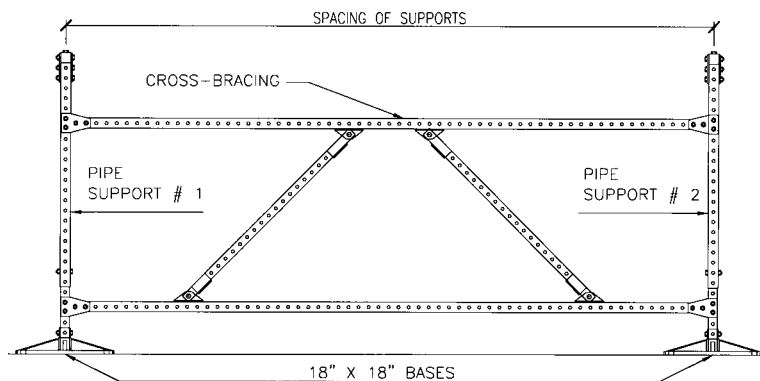
## Straight Bracing

Straight Bracing for pipes 24" above the roof surface and higher



## K-Bracing

"K" bracing for pipes 24" above the roof surface and higher

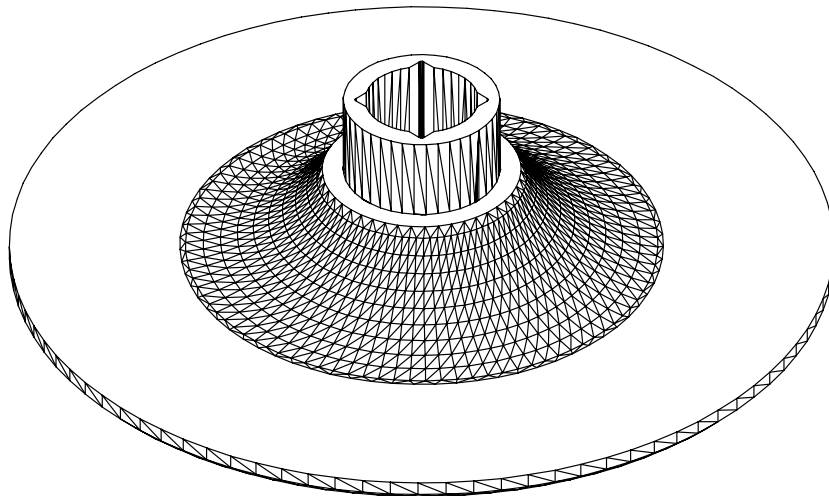
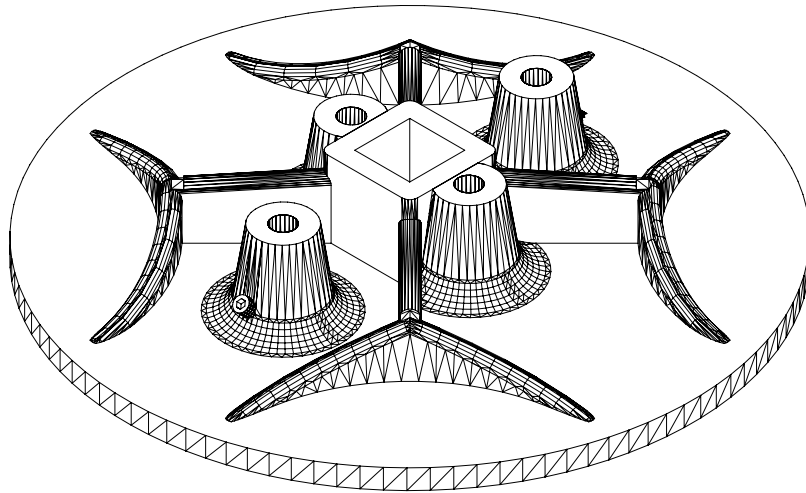


For PS and PSE Custom Supports





# ROUND BASE SUPPORT SYSTEMS



# PPH-RB15

## Installation

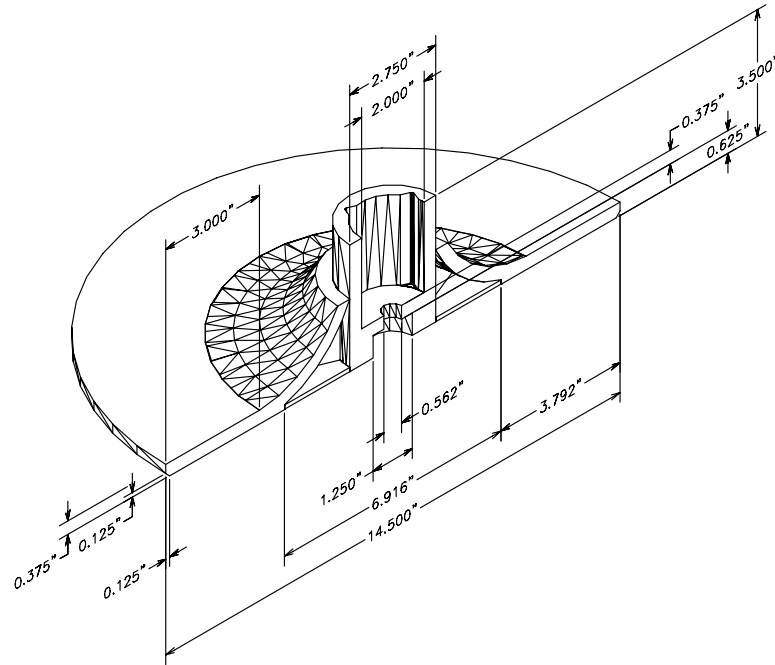
1. All PHP Systems are pre-assembled (no field assembly).
  2. Sweep off loose gravel, if present.
  3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
  4. Determine spacing of supports.
  5. Fully adhere isolation pads to roof system if required.
  4. After pads are installed, place bases on pads.
  5. Attach pre-assembled support to bases and adjust as needed.
- Note: Support shall be adjustable to maintain existing elevation and slope.

## Product Specifications

Bases:	High Density Polypropylene Plastics & other additives for UV protection
Weight:	Base weight 2.05 pounds
Dimensions:	Base 15" diameter
Height:	Adjustable

For attachment method, specification sheets and general inquiry:  
Please contact PHP at (800) 797-6585.

# PPH-RB15



**Base Designed for Mechanical Attachment and  
for Flashing into Roof System**

# PPH-RB18 WITH ROLLER

## Installation

1. All PHP Systems are pre-assembled (no field assembly).
2. Sweep off loose gravel, if present.
3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
4. After pads are installed, place bases on pads.
5. With all pipe supports in place, start at the beginning of the system and adjust each roller to achieve a balanced system.

## Product Specifications

**Bases:** High Density Polypropylene Plastics & other additives for UV protection

**Weight:** Base with assembly 12.5 pounds

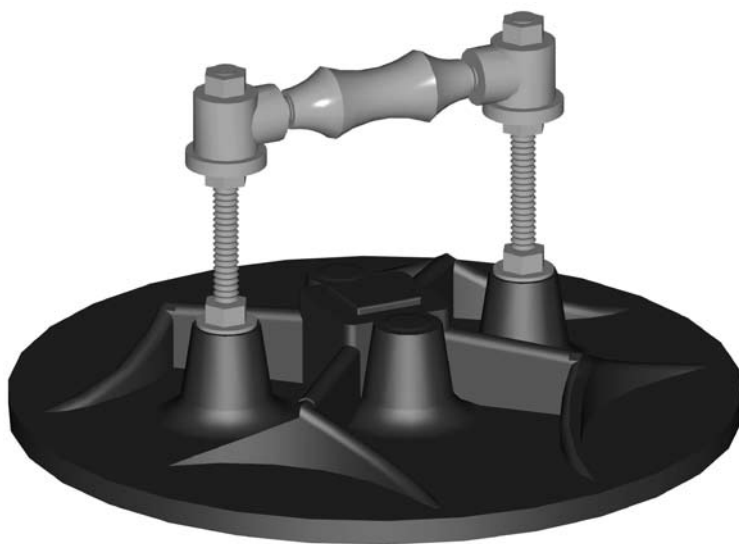
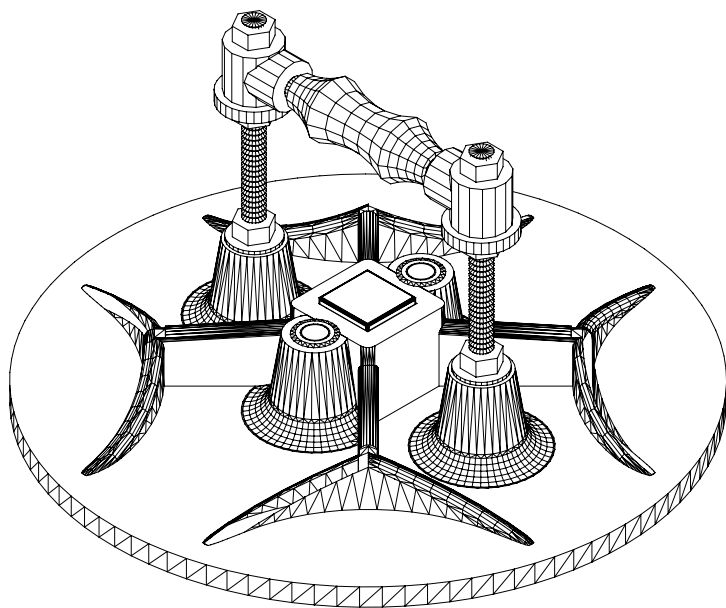
**Dimensions:** Base 18" diameter

**Height:** Adjustable

HDG or stainless steel threaded rods, nuts and washers

For pipe sizes 4" thru 6"

## PPH-RB18 WITH ROLLER



**For 4" to 5" Gas Lines**

*Base can be mechanically fastened if required  
(see pages 44-47)*

# PPH-RB18 WITH SWIVEL

## Installation

1. All PHP Systems are pre-assembled (no field assembly).
  2. Sweep off loose gravel, if present.
  3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
  4. Determine spacing of supports.
  5. Fully adhere isolation pads to roof system if required.
  6. After pads are installed, place bases on pads.
  7. Attach pre-assembled support to bases and adjust as needed.
- Note: Support shall be adjustable to maintain existing elevation and slope.

## Product Specifications

Bases: High Density Polypropylene Plastics & other additives for UV protection

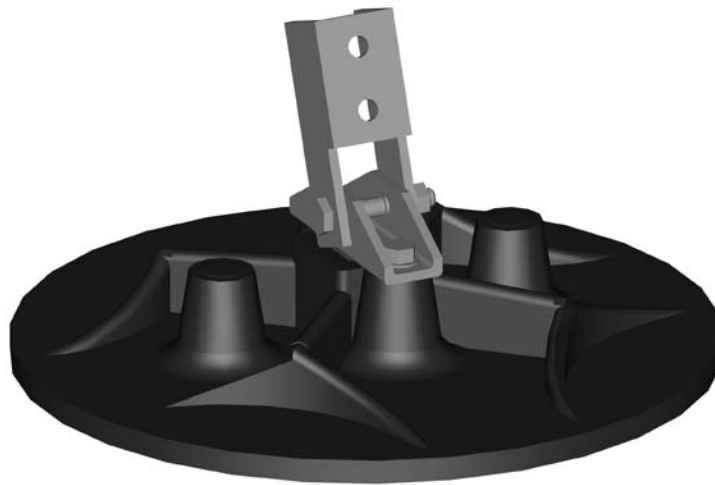
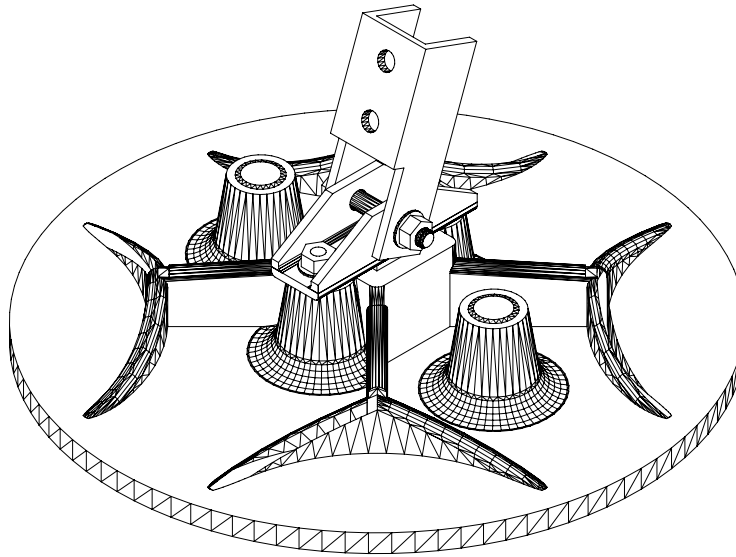
Weight: Base with assembly 10.5 pounds

Dimensions: Base 18" diameter

Swivel: ¼" Galvanized Steel

HDG or stainless steel threaded rods, nuts and washers

# PPH-RB18 WITH SWIVEL



**For Sloped and Tapered Roof Systems  
(equal to or exceeding ½" per foot)**

*Base can be mechanically fastened if required  
(see pages 44-47)*

# PPH-RB18 WITH LEVELING ASSEMBLY

## Installation

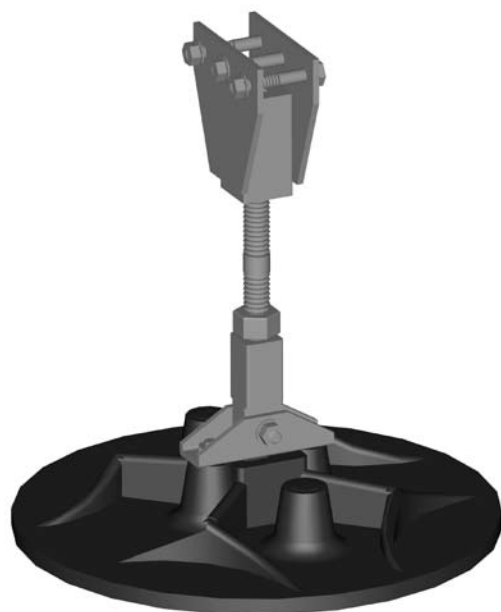
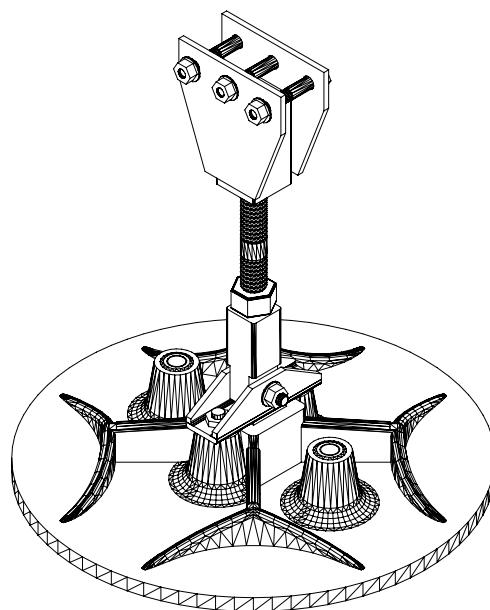
1. All PHP Systems are pre-assembled (no field assembly).
2. Sweep off loose gravel, if present.
3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
4. After isolation pads are installed, place base assembly on pads.
5. Attach substructure to Leveling Assembly. Place substructure with Leveling Assembly on pads.
6. Loosen lock nuts, then adjust Leveling Assembly to attain correct height.
7. Tighten lock nuts.

## Product Specifications

Bases:	High Density Polypropylene Plastics & other additives for UV protection
Weight:	Base with assembly 20 pounds
Dimensions:	Base 18" diameter
Leveling Assembly:	Swivel ¼" Galvanized Steel
HDG or stainless steel threaded rods, nuts and washers and ¼" steel plate	



# PPH-RB18 WITH LEVELING ASSEMBLY



## For Sloped and Flat Roof Systems

*Base can be mechanically fastened if required  
(see pages 44-47)*

# PPH-RB18 WITH PLATFORM SUPPORT SYSTEM

## Installation

1. All PHP Systems are pre-assembled (no field assembly).
2. Sweep off loose gravel, if present.
3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
4. Determine spacing of supports.
5. Fully adhere isolation pads to roof system if required.
6. After pads are installed, place bases on pads.
7. Attach pre-assembled support to bases and adjust as needed.  
Note: Support shall be adjustable to maintain existing elevation and slope.
8. Lay out bar grating on substructures and attach.

## Product Specifications

**Bases:** High Density Polypropylene Plastics & other additives for UV protection

**Weight:** Base with assembly 10.5 pounds

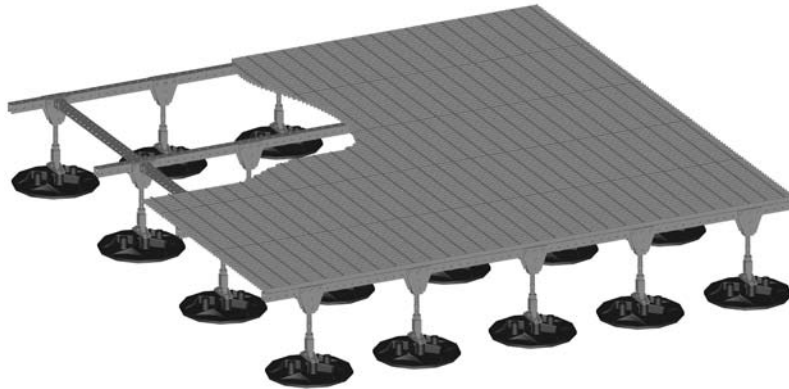
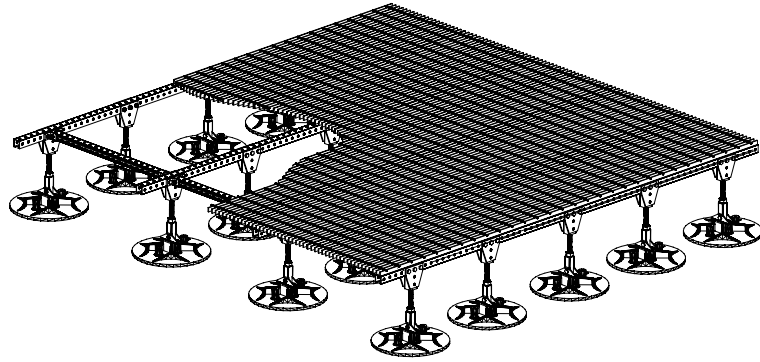
**Dimensions:** Base 18" diameter

**Swivel:** ¼" Galvanized Steel

HDG or stainless steel threaded rods, nuts and washers and ¼" steel plate

Bar Grating: Per customer specification

# PPH-RB18 WITH PLATFORM SUPPORT SYSTEM



- Seismic Approval to Zone 4
- Approved Raw-Land Site Applications
- Adjustable
- Modular Systems

*(For mechanically attaching the Platform to a wood, metal or structural concrete deck see pages 44-47)*

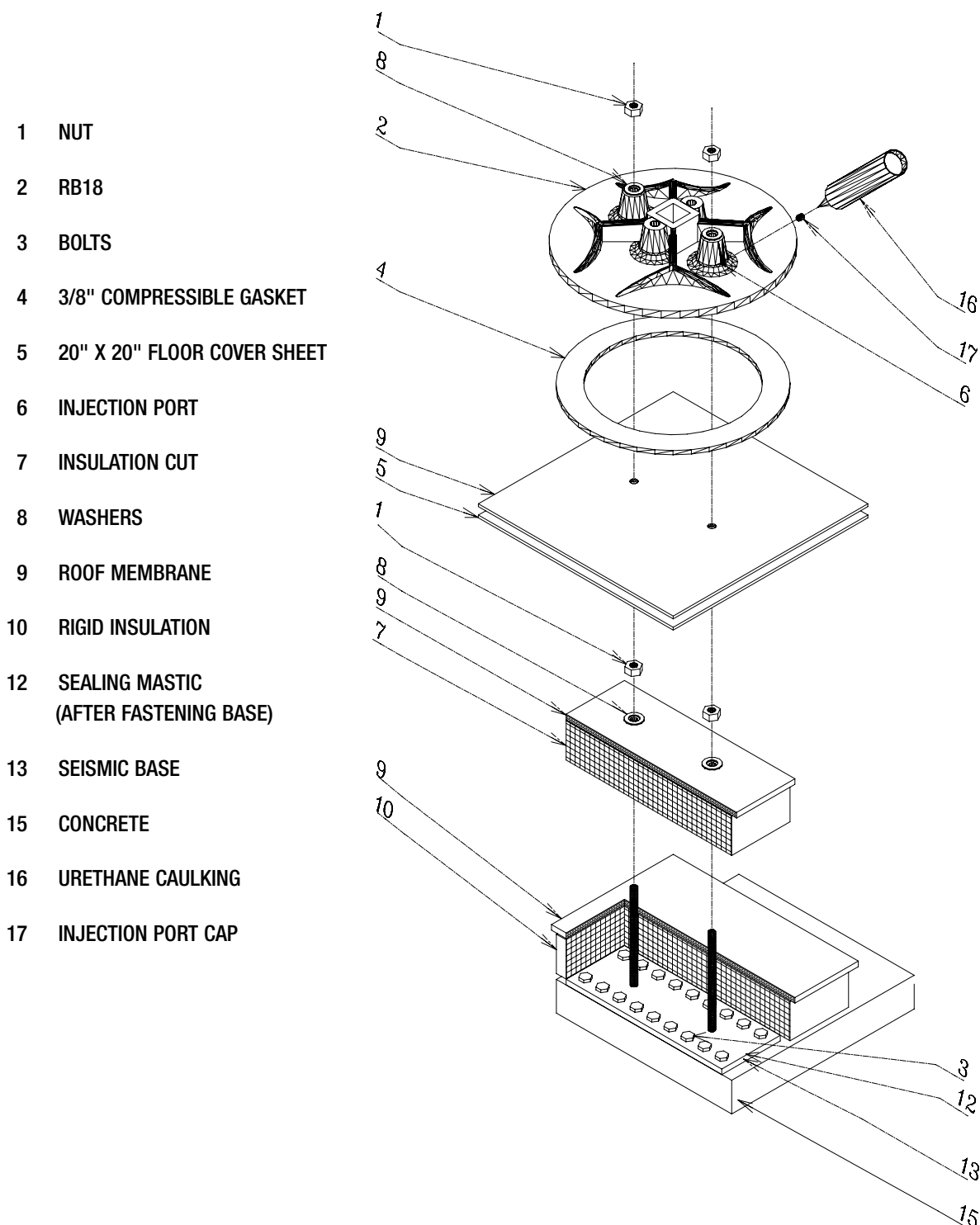
# Procedure for Mechanically Fastening the Round Base System

## Installation

1. Attach seismic plate with threaded rods to deck using appropriate fasteners for metal or concrete deck, or hex lag screw for wood deck (fastener must meet ICC standards).
2. Fill area with insulation or lightweight concrete as specified to required thickness.
3. Install roof membrane according to manufacturer's specifications.
4. Remove protective strip from gasket and place base directly over threaded rods and press firmly.
5. Hand tighten nuts firmly to base, and mechanically tighten five 360° rotations.
6. Place injection gun into port on each side of base, filling cavity until sealant is visible at vent.
7. Install exterior bead of sealant at perimeter of base.

*\*For optional procedures on various rooftop applications call 1.800.797.6585.*

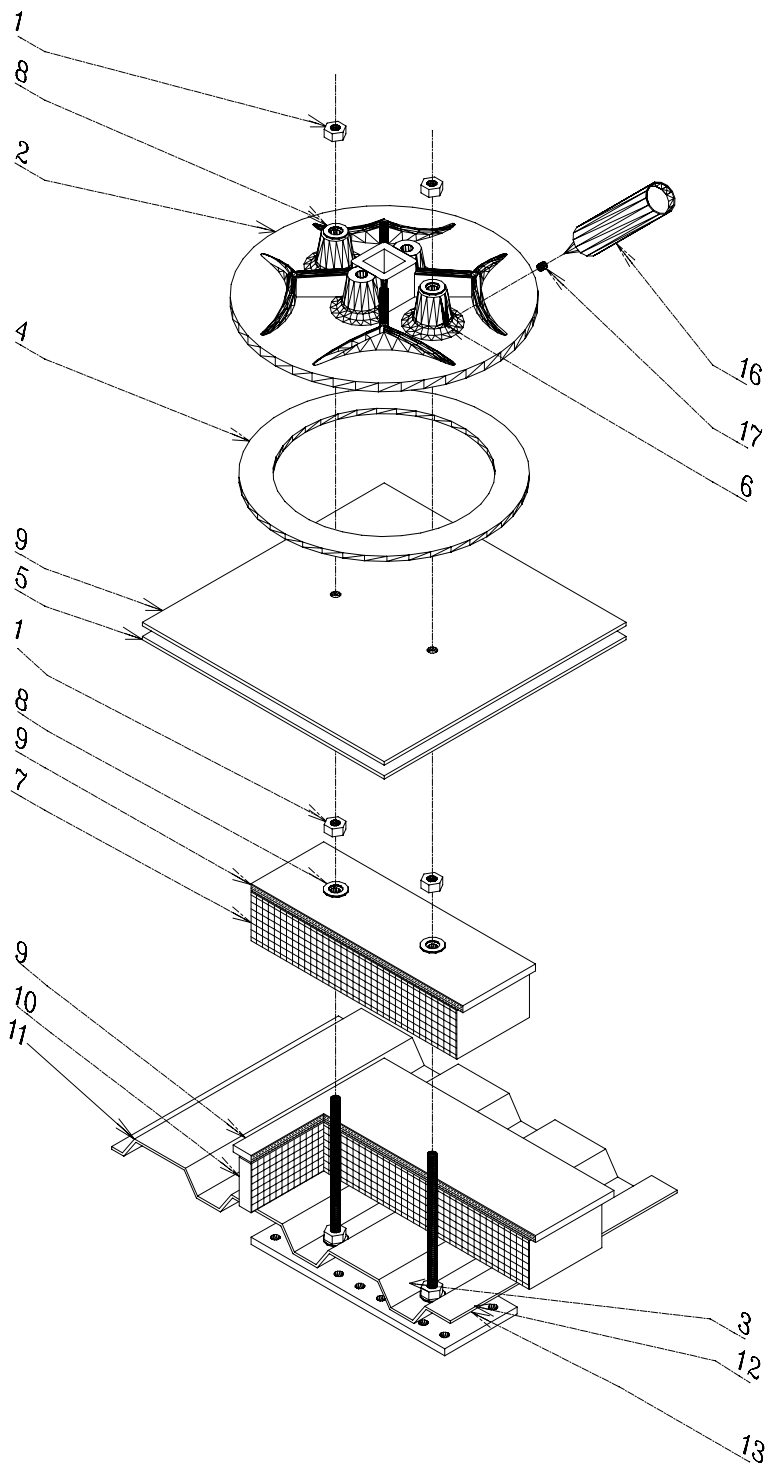
## Procedure for Mechanically Fastening the Round Base System



## RB18 Attached to Concrete, Metal and Wood Decking From Above

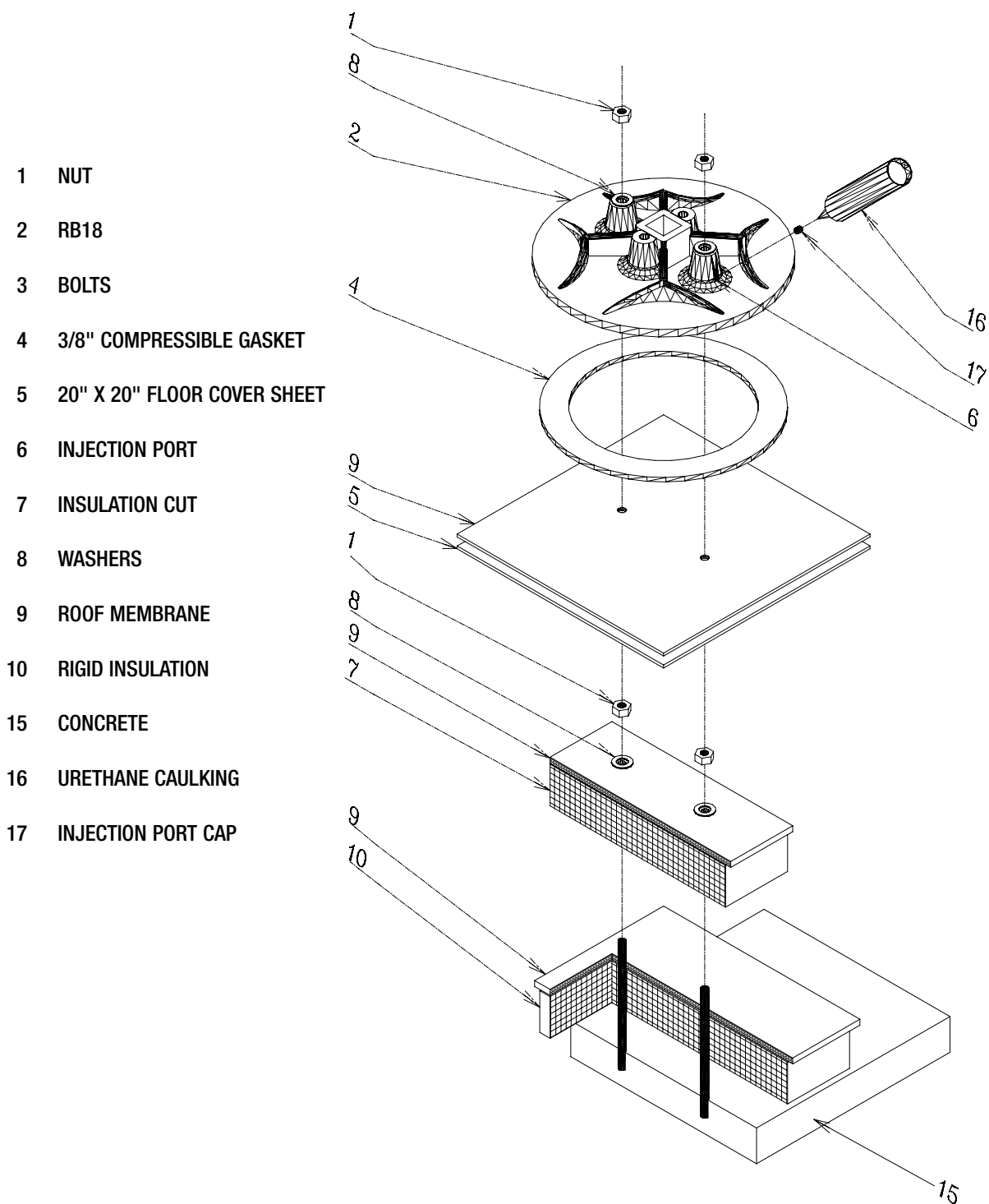
## Procedure for Mechanically Fastening the Round Base System

- 1 NUT
- 2 RB18
- 3 BOLTS
- 4 3/8" COMPRESSIBLE GASKET
- 5 20" X 20" FLOOR COVER SHEET
- 6 INJECTION PORT
- 7 INSULATION CUT
- 8 WASHERS
- 9 ROOF MEMBRANE
- 10 RIGID INSULATION
- 11 STEEL DECK
- 12 SEALING MASTIC  
(AFTER FASTENING BASE)
- 13 ATTACHMENT PLATE
- 16 URETHANE CAULKING
- 17 INJECTION PORT CAP

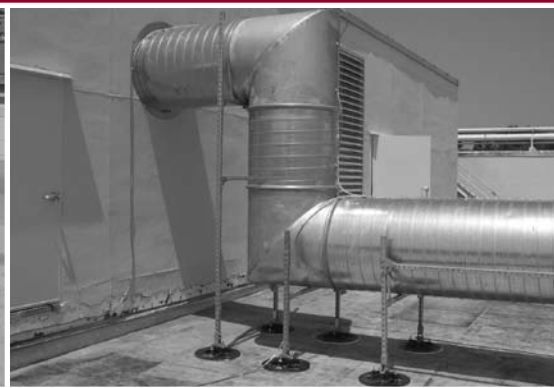


### RB18 Attached to Metal or Wood Decking From Below

## Procedure for Mechanically Fastening the Round Base System

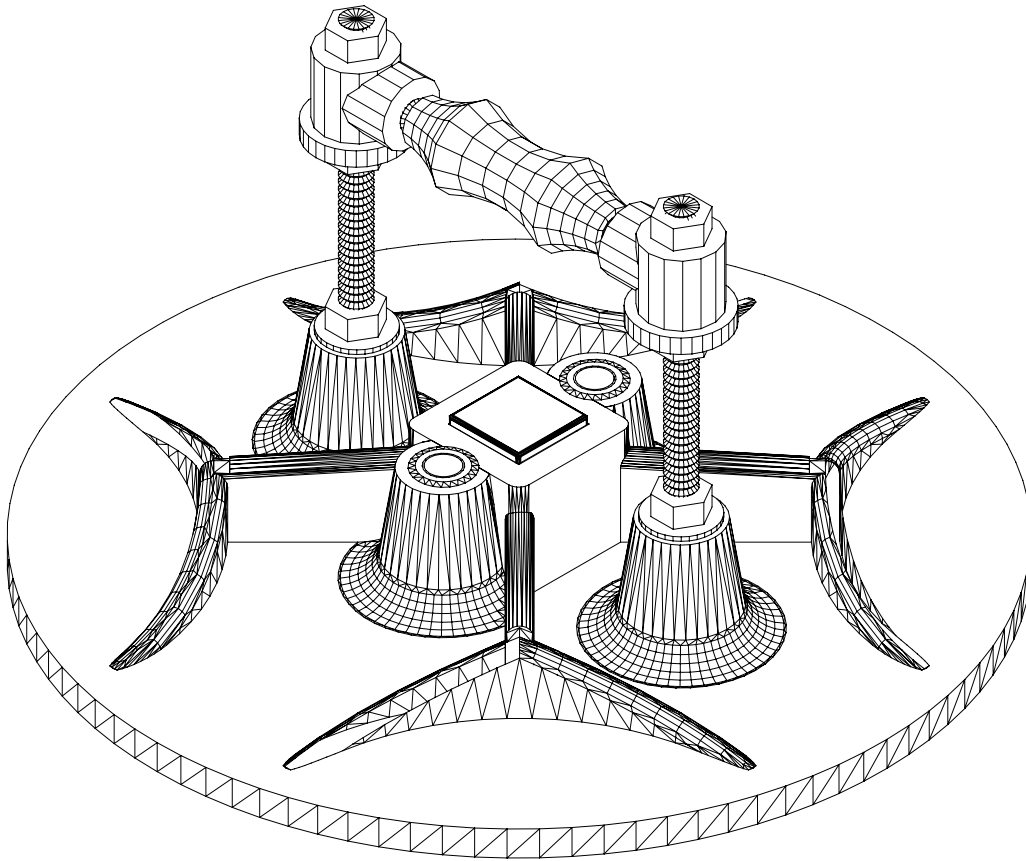


### RB18 Attached To Structural Concrete Decking





# EVALUATION & TESTING OF EQUIPMENT SUPPORT BASES



**SB**  
**SmithKline Beecham**  
Pharmaceuticals

May 6th, 1999

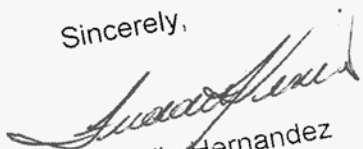
Mr. Art Valenz  
Portable Pipe Hangers, Inc.  
5534 Harvey Wilson Dr.  
Houston, Texas 77020

Dear Mr. Valenz:

I want to hereby acknowledge and commend the diligent and fine response you and your company devoted to SB Pharmco during the execution of the Coating and Granulation projects. The quality of the service and the products you represent are exceptional. This was clearly demonstrated during the recent emergency call to erect a chilled water header upon the plant roof, while modifying the special supports provided by PPH.

Again, thank you very much for your commitment to SB Pharmco and with the Projects Engineering Team.

Sincerely,



Freddie Hernandez  
Sr. Projects Manager

# EVALUATION & TESTING OF EQUIPMENT SUPPORT BASES

Mr. Art Valentz  
PHP Systems and Design  
5534 Harvey Wilson Drive  
Houston, Texas 77020

**SUBJECT: EVALUATION AND TESTING OF EQUIPMENT SUPPORT BASES**  
**PHP Systems and Design**  
**Houston, Texas**  
**LAW Project No. 60120-0-2088**

Dear Mr. Valentz:

Law Engineering and Environmental Services, Inc. (LAW) is pleased to present this report of the fastener design and material testing of PHP Systems and Design, (PHP) high-density polyethylene pipe hanger assembly support bases. Our consulting services were performed in general accordance with our proposal entitled "Proposal for Limited Structural Engineering Services" and authorized by Mr. Art Valentz of PHP.

Our report presents a three-phase approach to the design and evaluation of the 18-inch-round support bases. Calculations for the design of the support base roof fasteners were performed as Phase One. AutoCAD drawings of the designs for three different roof types, concrete, steel and wood, were developed. Limited material property testing to evaluate engineering characteristics of the support bases were completed in Phase Two. This report comprises Phase Three with our findings and observations from Phases One and Two.

## 1.0 PROJECT INFORMATION

The typical application for the support bases is to provide the "footings" for roof-mounted pipe rack frames, typically constructed of galvanized steel frames and hangers. However, other types of roof-mounted equipment such as conduits and electrical and telecommunications boxes can also be supported from the bases. The support bases have four holes: two holes for fastening the support base to the roof system and two holes for connecting the frame to the support base. The support base is eighteen-inches in diameter and approximately  $\frac{5}{8}$ -inch thick, with stiffening ribs distributed over its top surface. The fastener holes are stiffened and extend approximately 3 inches above the bottom of the base.

# EVALUATION & TESTING OF EQUIPMENT SUPPORT BASES

## 2.0 DESIGN CRITERIA

The calculations performed in our evaluation and design phase determined the maximum gravity load that can be applied to a single support base, when it is subject to seismic lateral forces. The seismic forces used were determined per Seismic Zone 4 of the 1997 Uniform Building Code. These are the greatest design loads that will be experienced by the support bases except for blast-type or tornadic loadings. Due to the offset of the connection of the typical steel support at the top of the base, an overturning moment is produced in addition to the lateral shear. This overturning moment along with the gravity load on the base exerts a compressive force on the roofing and insulation. It is the compressive stress on the insulation that is the limiting factor for the design of the support bases. When the insulation is over-stressed, the roofing system may become compromised.

The following are our assumptions for the design of the support bases:

- Eight-foot spacing of pipe support frames
- Supported pipes are filled with water and all pipes are supported at the same height above the roof surface
- Pipes are braced relative to the support frame
- Pipe support frame is rigid and capable of resisting overturning and lateral forces
- Pipe hangers and attachments are capable of withstanding the required forces
- Seismic design forces are as developed by Section 1630.2 of the 1997 Uniform Building Code for Seismic Zone 4.  $F=ZICW$ ;  $Z=0.4$ ,  $I=1.0$ ,  $C=1.5$ ,  $W=wt.$  of equipment
- Allowable bearing compressive stress for the roofing insulation is 5 pounds per square inch

The design is based on two types of pipe support frames. 1) A pipe supported by a rigid steel frame supported from two support bases and a minimum support base spacing of 22 inches is assumed for single pipes, and 2) Pipe supported by a rigid steel frame supported by three support bases and located 27 inches apart in two bays were assumed for four pipes. For greater bay widths, only a slight increase in maximum allowable gravity load on a support base is afforded. Also, for lower heights of the pipes above the roof an increase in allowable gravity load on a support base is found. All support bases for the two types of pipe support frames are fastened to the roof structure.

# EVALUATION & TESTING OF EQUIPMENT SUPPORT BASES

A summary of the design calculations based on the above assumptions is presented as follows:

TABLE 2.1		
Support Frame Type	Maximum Quantity and Size of Pipes Supported	Maximum Height of Centerline of Pipe Above Roof Surface (inch)
Two support bases	1- 12-inch diameter	16
Three support bases	4- 6-inch diameter	18

Loads along the length of the supported pipes will vary according to length of the pipes and how the pipes are connected to the equipment they serve. Bracing of the pipe support frames for these types of loads must be carefully selected for specific locations as these loads can become significant at a restrained pipe. We recommend that a design be performed by a registered professional engineer.

Another application of the support bases is for the support of roof-mounted electrical and telecommunications equipment. The same anchor connections to the roof system as used for pipe supports may be used; however, more support bases may be employed, thereby reducing the gravity load on a per support base basis from that typically found with piping support loads.

Based on our design assumptions and calculations, determining the number of the support bases requiring through roof fasteners is accomplished by the following simple procedure:

Divide the equipment's total weight by 382 pounds. Round this number up to the nearest even number. This is the number of support bases required to be anchored to the roof structure with the specified fasteners.

The support bases fastened to the roof structure should be symmetrically distributed to the four corners of the equipment supported and about the equipment's center of gravity.

To limit compressive stresses imparted to the roof insulation, we recommend the tension force applied to the through-roof fasteners be closely monitored during installation of the support bases. At the time of this report we are investigating a low-load direct tension indicator which will assist in maintaining an installed compressive stress on the insulation of less than 1 psi. As a guideline, the fasteners should be installed only hand-tight.

# EVALUATION & TESTING OF EQUIPMENT SUPPORT BASES

## 3.0 LABORATORY TESTING

As part of LAW's evaluation of the support bases, we performed material testing of physical properties of the support bases. Two separate tests were performed on actual production support bases provided by PHP. The first test was a shear test where the shear strength of a support base with a load applied by a  $\frac{5}{8}$ -inch diameter fastener in one of the through-roof fastener holes was tested. The second test was a pull-out test where the strength of one of the through-roof fastener holes was tested by pulling a  $\frac{5}{8}$ -inch diameter fastener with nut and washer through the hole. These tests were performed on a Tinius-Olsen Super "L" Universal Testing Machine in LAW's Houston facility. The tests were performed till failure. All of the tests were performed with the specimens at a temperature of 73 deg F. The results of the tests are as follows:

### TEST A – SHEAR TEST

SPECIMEN	MAXIMUM LOAD (Lbs.)	TYPE OF FAILURE
1A	4,650	Fracture thru net section
2A	3,900	Fracture thru net section

### TEST B – PULL-OUT TEST

SPECIMEN	MAXIMUM LOAD (Lbs.)	TYPE OF FAILURE
1B	8,375	Split along seam
2B	8,050	Split along seam

## 4.0 CONCLUSIONS

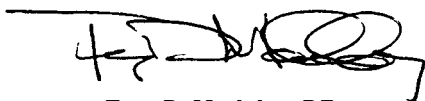
Details of the connections of the support bases to three different types of roof level structures are attached. The findings and observations presented in this report were considered for the design of the connections. The design forces placed on the support base are significantly less than the maximum loads attained by the support bases during the laboratory testing. Based on the findings of our calculations and the nature of their exposed condition, stronger stainless steel fasteners are specified for the connections due to the bending in the fastener from the

# EVALUATION & TESTING OF EQUIPMENT SUPPORT BASES

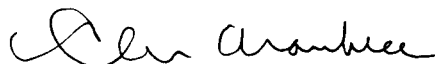
eccentricity caused by the roof insulation thickness. Any deviation greater than the specified insulation thickness will result in a larger diameter fastener. For the thin deck roofs, steel and wood, a toggle-type anchor is specified for blind installation from the top of the roof system. These designs and conclusions herein were based on maximum forces due to seismic activity and wind events.

Respectfully submitted,

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.**



**Troy D. Madeley, P.E.**  
Senior Structural Engineer

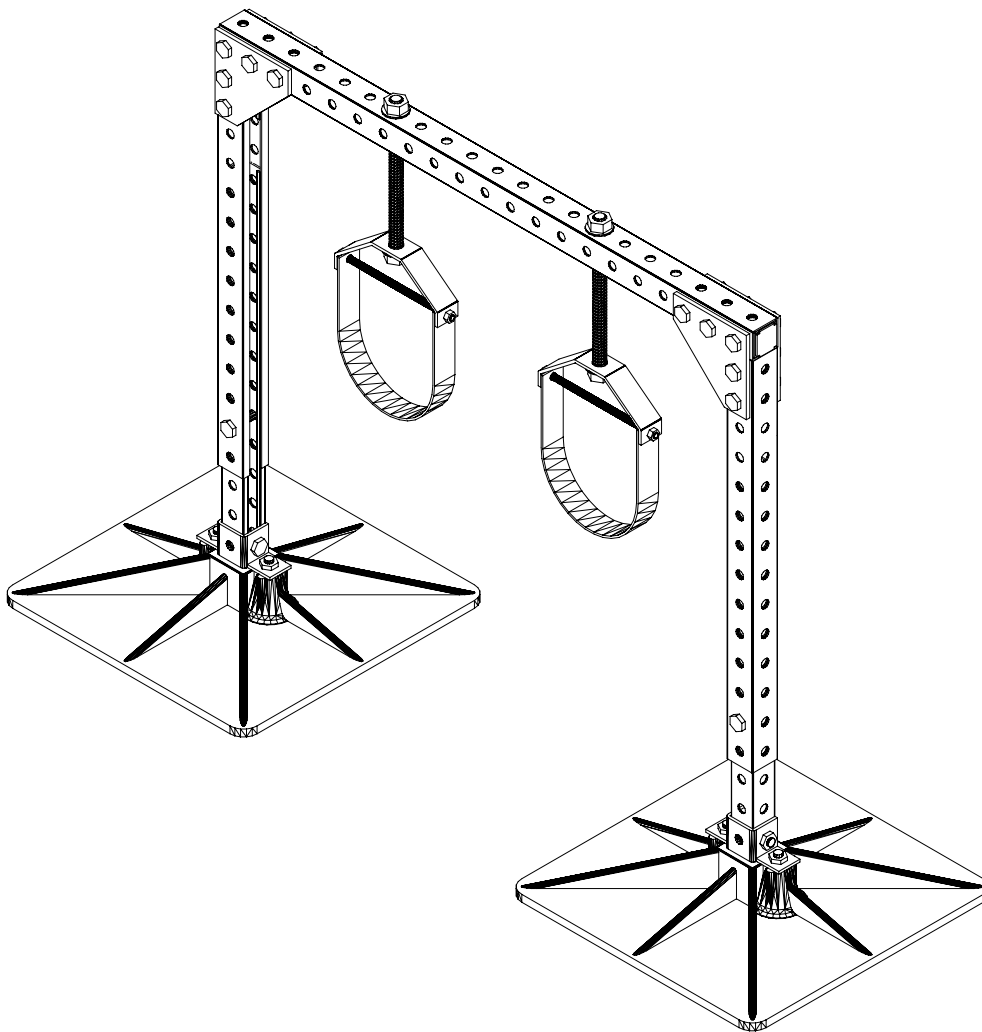


**Glen Chamblee, AIA**  
Principal Architect

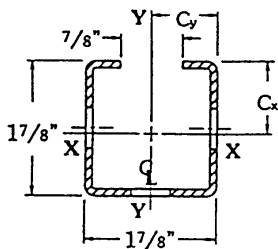




# TELESCOPING CHANNEL SYSTEMS



# COMPONENT DATA

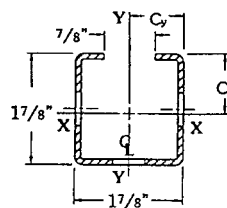


**BTS22TH-**

Telescoping Channel fits over all 1<sup>5</sup>/<sub>8</sub>" x 1<sup>5</sup>/<sub>8</sub>" channels  
<sup>9</sup>/<sub>16</sub>" holes on 1<sup>7</sup>/<sub>8</sub>" centers  
 12 gauge material thickness

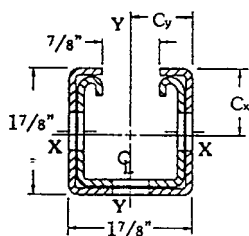
Section Properties		X-X Axis					Y-Y Axis			
Channel Weight	Area lbs/ft	Cx In <sup>2</sup>	Ix In	Sx In <sup>4</sup>	rx In <sup>3</sup>	Cy In	Iy In	Sy In <sup>4</sup>	ry In <sup>3</sup>	In
BTS22TH	1.934	0.4401	1.0090	0.2459	0.2437	0.7475	0.9425	0.2696	0.2860	0.7827

**B22TH - Three Hole Channel**  
<sup>9</sup>/<sub>16</sub>" holes on 1<sup>7</sup>/<sub>8</sub>" centers  
 12 gauge material thickness



Section Properties		X-X Axis					Y-Y Axis			
Channel Weight	Area lbs/ft	Cx In <sup>2</sup>	Ix In	Sx In <sup>4</sup>	rx In <sup>3</sup>	Cy In	Iy In	Sy In <sup>4</sup>	ry In <sup>3</sup>	In
B22TH	1.663	0.3602	0.8462	0.1582	0.1870	0.6363	0.8125	0.1458	0.1794	0.6627

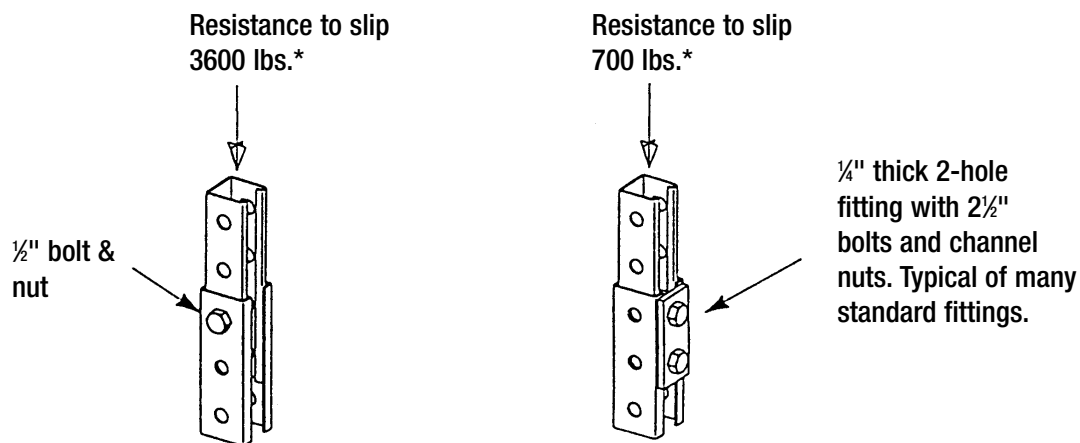
# CONNECTION DATA



Combination of BTS22TH & B22TH

Section Properties			X-X Axis				Y-Y Axis				
Channel	Weight	Area lbs/ft	Cx In <sup>2</sup>	Ix In	Sx In <sup>4</sup>	rx In <sup>3</sup>	Cy In	Iy In	Sy In <sup>4</sup>	ry In <sup>3</sup>	In
Combination											
BTS22TH/B22TH	3.597	0.8003	0.9942	0.3920	0.3943	0.6998	0.9425	0.4278	0.4539	0.7312	

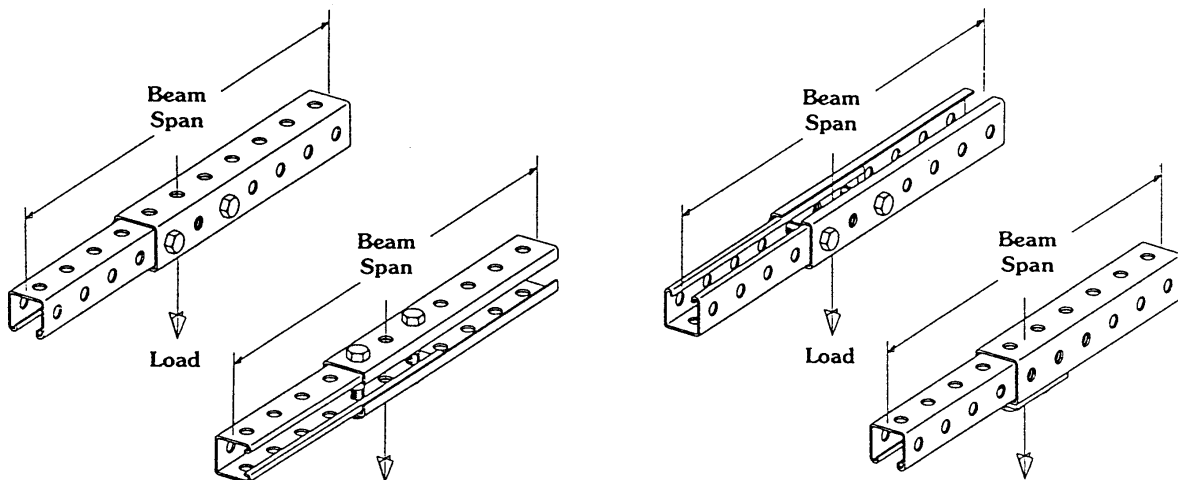
## Slip Load Data



\*With a safety factor of 3

# CONNECTION DATA

The flexibility of the telescoping channel system allows many different connection configurations. Several typical beam loading details are shown below.



In all of these cases, the 1 $\frac{5}{8}$ " B22TH channel is the limiting factor when determining the ultimate beam strength. It is our general recommendation that all telescoping beam members be overlapped a minimum of 3 holes (5 $\frac{1}{2}$ ") and use two  $\frac{1}{2}$ " diameter bolts with hex nuts or channel nuts. Overlapping the members more than three holes results in increased strength and less deflection.

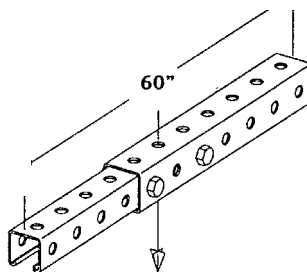
To determine the beam strength of a partially telescoped beam, use the beam loading chart for "B22TH" for the overall span.

**Example:**

Determine the allowable loading of the telescoped beam.

**Solution:**

Use beam load data for "B22TH."



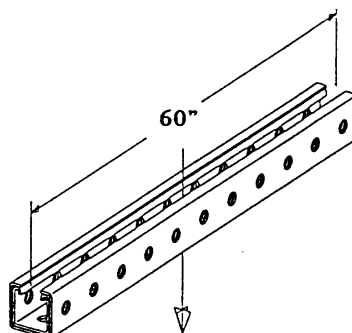
Allowable load = 615 lbs.

To determine the beam strength of a fully telescoped beam, use the beam loading chart for "BTS22TH & B22TH" for the overall span.

**Example:**

Determine the allowable loading of the beam.

**Solution:** Use beam load data for "BTS22TH & B22TH."

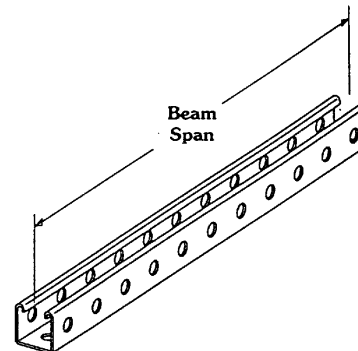


Allowable load = 1449 lbs.

# BEAM LOADING DATA

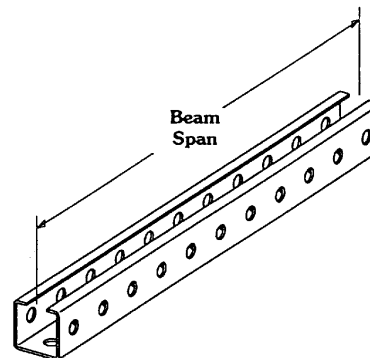
## B22TH

Beam Load Data x-x Axis			
Beam Span (in.)	Allowable Load (lbs.)*	Resulting Deflection (in.)	Allowable Load @ Deflection = 1/240 Span
12	3115	0.015	3115
24	1555	0.059	1555
36	1034	0.133	1034
48	773	0.236	653
60	615	0.369	414
72	509	0.532	283
84	434	0.724	204
96	376	0.946	151
108	331	1.197	115
120	295	1.478	89



## BTS22TH

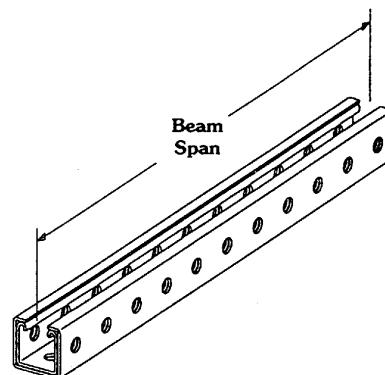
Beam Load Data x-x Axis			
Beam Span (in.)	Allowable Load (lbs.)*	Resulting Deflection (in.)	Allowable Load @ Deflection = 1/240 Span
12	3986	0.012	3986
24	1990	0.049	1990
36	1324	0.109	1324
48	989	0.195	989
60	788	0.304	646
72	653	0.438	444
84	556	0.596	321
96	483	0.779	241
108	426	0.985	185
120	379	1.216	145



## B22TH & BTS22TH

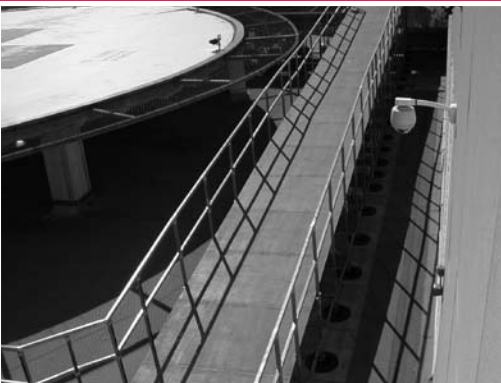
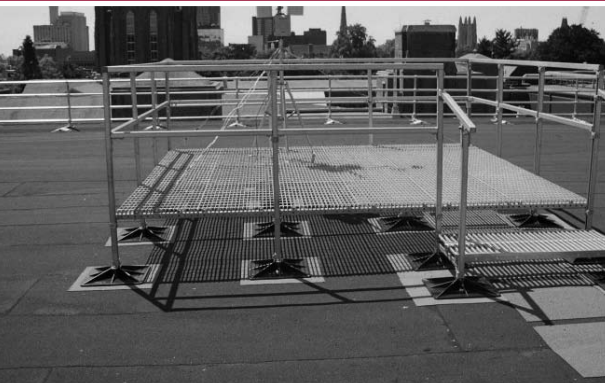
Telescoping Members of Equal Length

Beam Load Data x-x Axis			
Beam Span (in.)	Allowable Load (lbs.)*	Resulting Deflection (in.)	Allowable Load @ Deflection = 1/240 Span
12	7331	0.014	7331
24	3660	0.056	3660
36	2434	0.126	2434
48	1819	0.225	1619
60	1449	0.351	1027
72	1200	0.505	704
84	1022	0.688	507
96	887	0.898	379
108	782	1.137	289
120	697	1.403	224

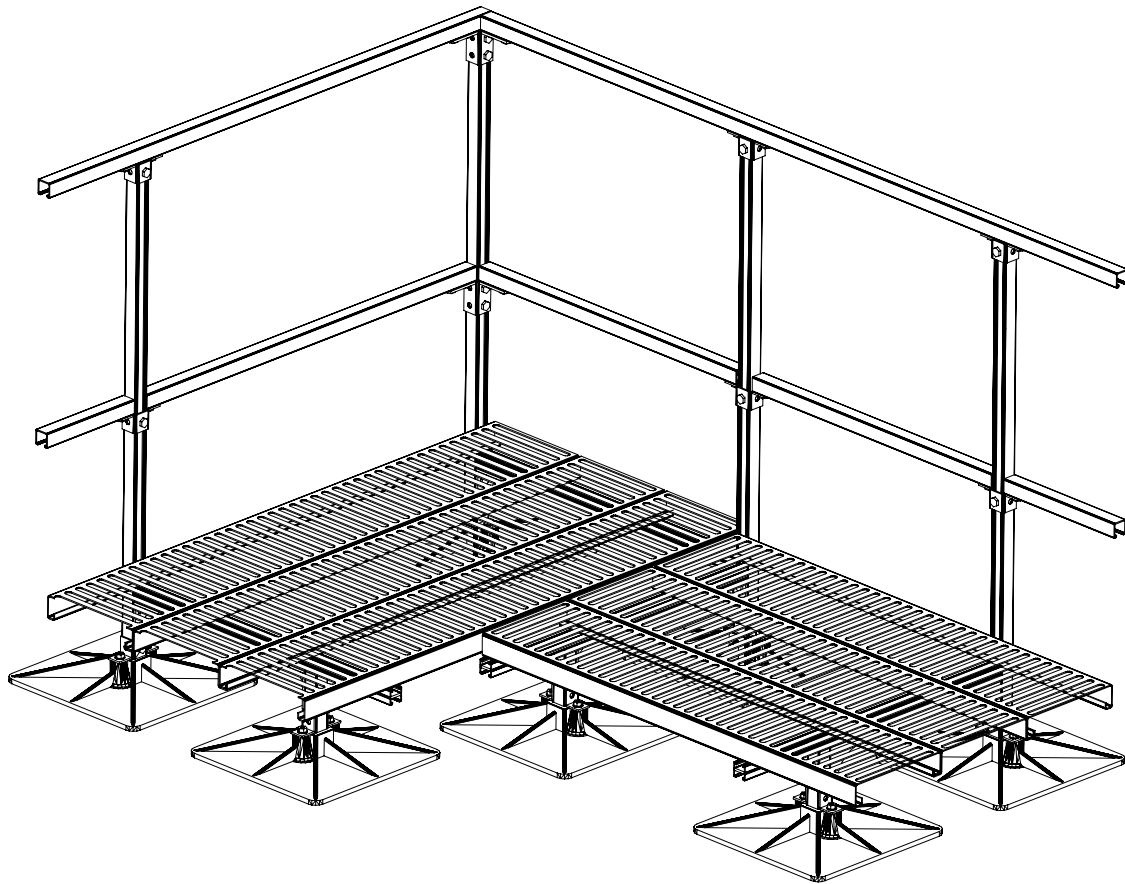


\* Based on simple beam condition using an allowable design stress of 25,000 psi (172 MPa) with adequate material bracing.

\* To determine concentrated load capacity at mid-span, multiply uniform load by 0.5 and corresponding deflection by 0.8.



# WALKWAY SYSTEMS



# WALKWAY SYSTEMS

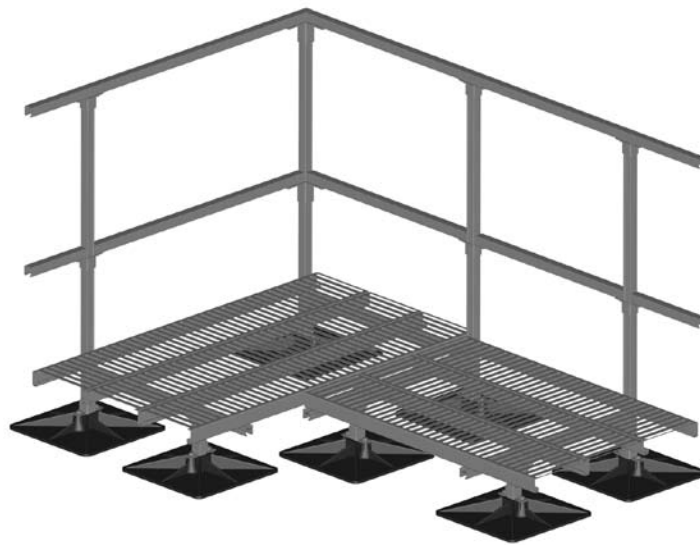
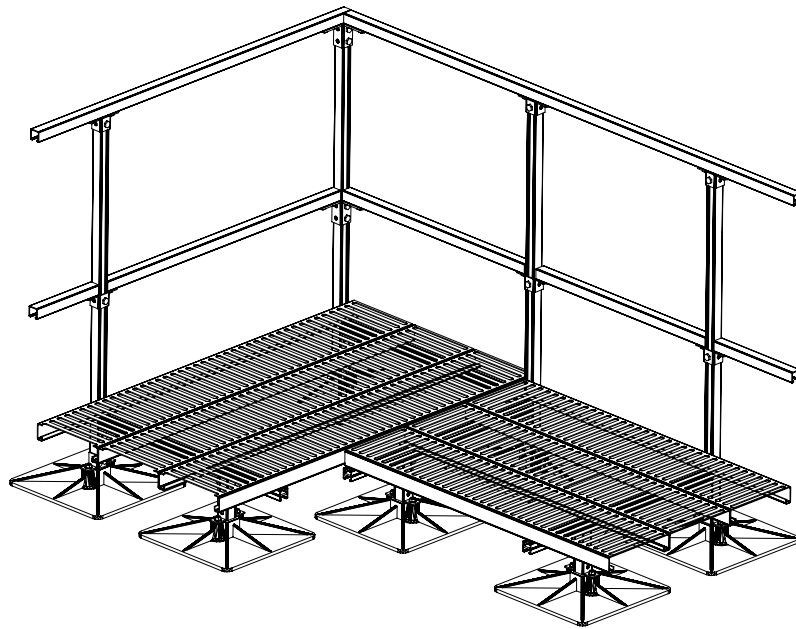
## Standard System Specifications

1. Elevated walkway systems routed across the roof shall be supported off the roof by an engineered, prefabricated Walkway System, specifically designed to be installed directly onto the roof without roof penetrations, flashings or damage to the roofing material.
2. The system shall be designed to support all weight and equipment as required.
3. The system shall consist of the following:
  - a. Bases are to be made of High Density Polypropylene Plastics and other additives for UV protection. Material with inserts for channel or threaded rods as required.
  - b. The substructure is made of a 12 gauge back to back channel G-1012A, and is supported directly from the bases.
  - c. The grating material is made from mill-galvanized carbon steel.

Metal gauge:	14-ga. steel, 16-ga. steel, 18-ga. steel
Finish:	Mill-galvanized before fabrication, ASTM A525
Section Width:	12", 9", 6"
Grating Height:	1½", 2½", 3" and 4"
Standard Lengths:	12', 20', 24' (other lengths to order)
Flange Options:	FM, MM, FF
Surface condition:	MG – traction grip, MS – smooth
  - d. The handrail is assembled from a 12 gauge, 1½" channel G-5812.
4. All substructures and handrails shall be galvanized steel. Nuts, threaded rods and washers shall be electro-plated.
5. Elevated walkway systems shall be manufactured by PHP Systems and Design.



# WALKWAY SYSTEMS



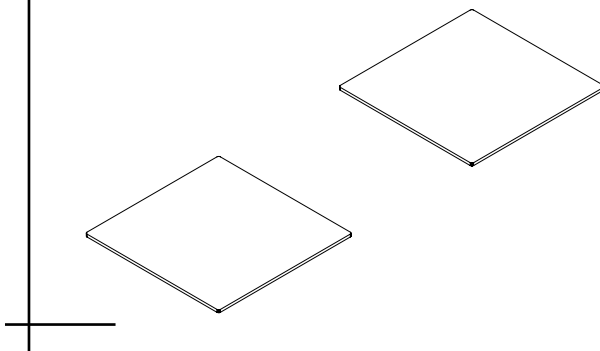
**Elevated Systems for Built-up, Single-ply, Sloped and  
Standing Seam Metal Roofs**

# FOUR-STEP WALKWAY ASSEMBLY

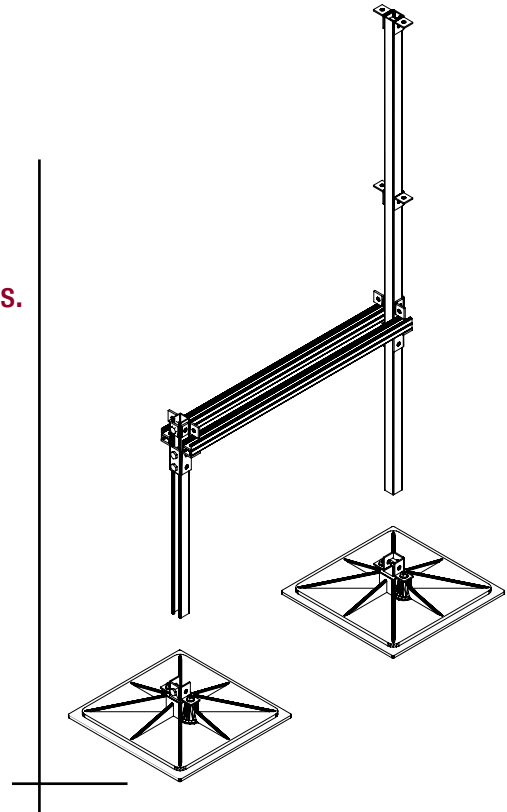
## Before Assembly...

1. Determine spacing of substructures.
2. Sweep off loose gravel, if present.
3. Isolation Pads:
  - a. Must be compatible with existing roof or new roofing system being installed (check with manufacturer).
  - b. Not necessary to be adhered to roofing membrane.
4. Alignment of Substructures:
  - a. Splice Assembly - Used to join one 20' span of planking to another.
  - b. Straight Assembly - Intermediate support between splices. The quantity will depend on the weight to be supported and distributed.
  - c. Corner Assembly - Can be right or left turn.
5. Handrails:
  - a. If handrails are required, the hardware for attaching said handrail will have been installed at the factory, and the intermediate rail will have been cut to size.
  - b. For ease of installation, the top handrail will come in 20' lengths.

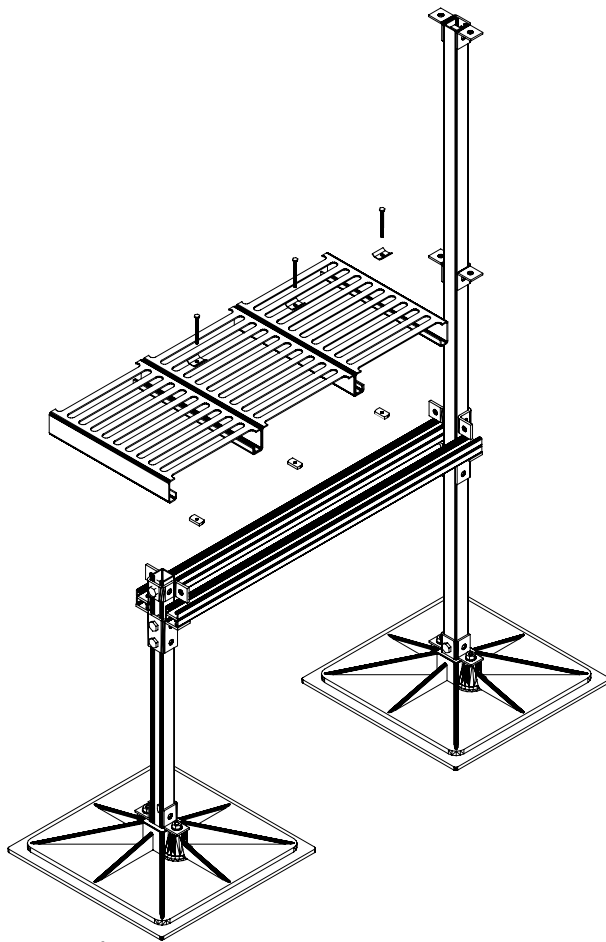
**1** Place appropriate isolation pads in place.



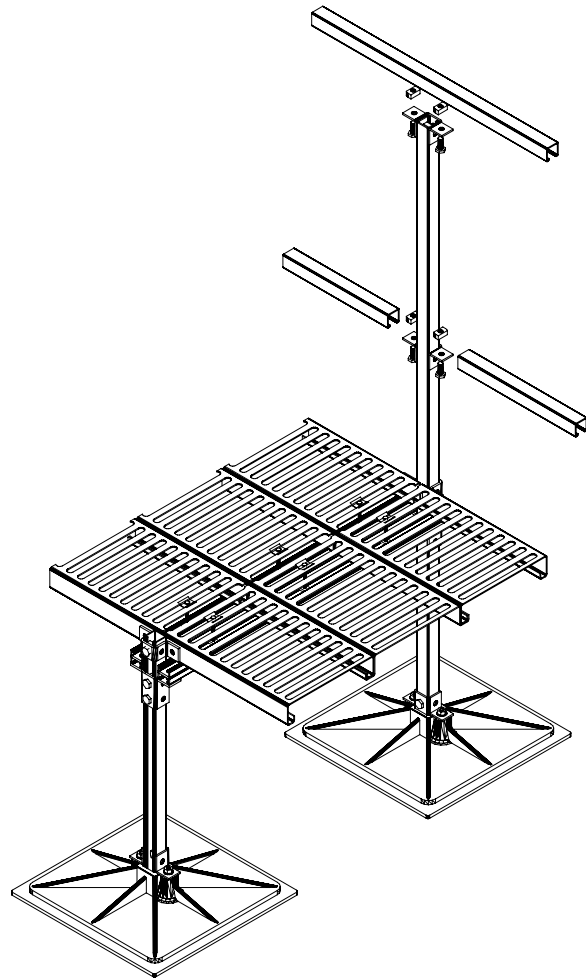
**2** Place bases on isolation pads and insert legs of substructures.



# FOUR-STEP WALKWAY ASSEMBLY



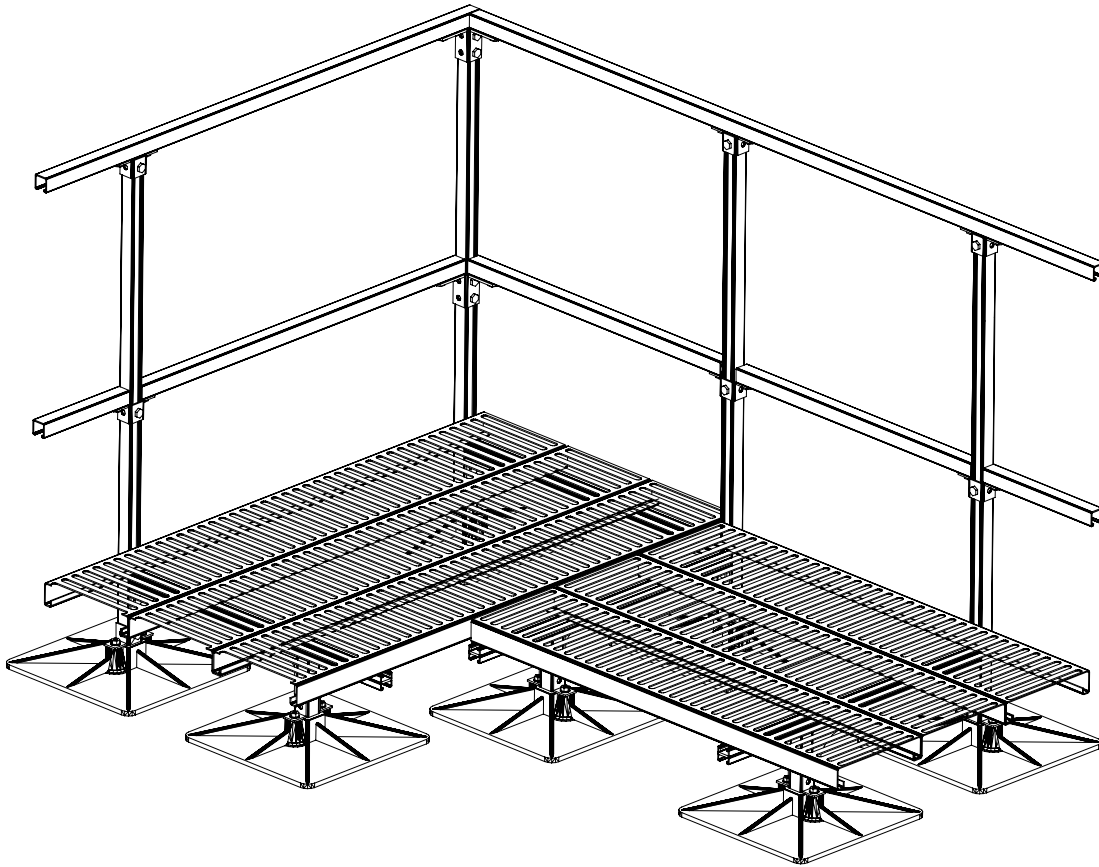
- 3** Lay out planking. Make whatever minor adjustments are needed (spacing of substructures to accommodate the intermediate handrail, if required) and install hold-downs.



- 4** Place the handrails on top of the factory-installed hardware and secure with channel nuts and hex head cap screws.



# WALKWAY SYSTEM SUPPORT PRESSURE TABLES



# WALKWAY SYSTEM SUPPORT PRESSURE TABLES

PHP Systems and Design  
5534 Harvey Wilson Drive  
Houston, Texas 77020

Attention: Mr. Art Valentz

Subject: REPORT OF ENGINEERING SERVICES  
Walkway System Support Pressure Tables  
Houston, Texas  
LAW Project No. 60133-7-3035 Phase 02

Law Engineering and Environmental Services, Inc. (LAW) is pleased to submit this report of engineering services to develop tables of pressure below walkway system supports for several typical loading situations. This report was requested by Mr. Art Valentz, and contains our understanding of the project information, scope of services, our findings, and the basis of our findings.

## PROJECT INFORMATION

PHP Systems and Design (PHP) requested that LAW derive tables of the pressures under several different walkway systems. These tables are similar to those in LAW's November 17, 1995 Report (Project No. 306-08568 01). Tables were requested for walkway widths of 2, 3, and 4-feet (with no railing systems) subject to various expected loadings, as described in the Scope of Services section.

## SCOPE OF SERVICES

PHP retained LAW to develop tables indicating the pressure applied to the roofing system by three walkway widths for various load scenarios described below. We did not address the potential uplift by wind of these systems because these loads would be location specific. Our understanding of the walkway system types is presented below:

### For the 2' wide walkway:

Supports frames (2' wide) of back-to-back 12-gauge channel type members every 4'  
Both 12" by 12" and 18" by 18" roof pads  
Grate-Lock type grating sections (2.5" tall, 12" wide, 20' long, 18-gauge thickness)

### For the 3' wide walkway:

Supports frames (3' wide) of back-to-back 12 gauge channel type members every 4'  
Both 12" by 12" and 18" by 18" roof pads  
Grate-Lock type grating sections (2.5" tall, 12" wide, 20' long, 18-gauge thickness)

# WALKWAY SYSTEM SUPPORT PRESSURE TABLES

## For the 4' wide walkway:

Supports frames (4' wide) of back-to-back 12-gauge channel type members every 4'

Only the 18" by 18" roof pads

Grate-Lock type grating sections (2.5" tall, 6" wide, 20' long, 14-gauge thickness)

We have provided tables stating the pressure applied to the roof surface through the base of the supports for each of the above walkways subject to uniformly distributed live loads of 25, 50, 75, and 100 pounds per square foot (psf), as well as for one and two people weighing 150, 200, and 250 pounds (lbs). Dead loads due to frame and footing weights were included as well as catalog published values for the plank weights.

We have also determined the pressures due to a 1,800 to 2,000 pound gravity load from a garden tractor with trailer assembly on the 4' wide walkway. This loading will be treated as three 600 pound loads at 5' spacing and as a 400, 600, 1000 pound series (at 5' spacing). These results are presented in the Findings section below and the following page. We have not sized the individual support frames or connections.

## FINDINGS

For the walkway systems described above, we observed the pressure applied to the roof surface to be less than 5.0 pounds per square inch (psi). Note that the pressures applied to the roof have been rounded up to the nearest tenth of a pound (lb), that is 1.01 pounds per square inch (psi) is shown as 1.1 psi. The full weight of (one or two) people on the planking has conservatively been assigned to a single footing pad. The tables on the following page present our findings.

# WALKWAY SYSTEM SUPPORT PRESSURE TABLES

Table 1. Roof Pressures Under 2' Wide Walkway for Various Load Cases Shown

Load					one	two	one	two	one	two
Case	25 psf	50 psf	75 psf	100 psf	150 lb	150 lb	200 lb	200 lb	250 lb	250 lb
Pads										
12"x12"	0.9 psi	1.6 psi	2.3 psi	3.0 psi	1.2 psi	2.3 psi	1.6 psi	3.0 psi	1.9 psi	3.7 psi
Pads										
18"x18"	0.4 psi	0.7 psi	1.1 psi	1.4 psi	0.6 psi	1.1 psi	0.7 psi	1.4 psi	0.9 psi	1.7 psi

Table 2. Roof Pressures Under 3' Wide Walkway for Various Load Cases Shown

Load					one	two	one	two	one	two
Case	25 psf	50 psf	75 psf	100 psf	150 lb	150 lb	200 lb	200 lb	250 lb	250 lb
Pads										
12"x12"	1.3 psi	2.3 psi	3.4 psi	4.4 psi	1.3 psi	2.4 psi	1.7 psi	3.0 psi	2.0 psi	3.7 psi
Pads										
18"x18"	0.6 psi	1.1 psi	1.5 psi	2.0 psi	0.6 psi	1.1 psi	0.8 psi	1.4 psi	0.9 psi	1.7 psi

Table 3. Roof Pressures Under 4' Wide Walkway for Various Load Cases Shown

Load					one	two	one	two	one	two
Case	25 psf	50 psf	75 psf	100 psf	150 lb	150 lb	200 lb	200 lb	250 lb	250 lb
Pads										
18"x18"	0.9 psi	1.5 psi	2.2 psi	2.8 psi	0.8 psi	1.2 psi	0.9 psi	1.5 psi	1.1 psi	1.8 psi

For the lawn tractor and wagon load modeled as three 600 pound loads at 5' centers, the pressure expected under the 18"x18" pads is 1.2 psi. If the lawn tractor and wagon is modeled as a 1000, 600, and 400 pound series at 5' centers, the pressure expected under these pads increases to 1.8 psi, still well below the previously established limit of 5.0 psi.



# WALKWAY SYSTEM SUPPORT PRESSURE TABLES

## BASIS OF FINDINGS

- PHP provided the load cases considered.
- The 1994 Uniform Building Code design load for pedestrian bridges and walkways is a uniform load of 100 psf. Stage catwalks require a design live load of 40 psf.
- Wind loads and earthquake loads have not been considered in the pressure calculations.
- The design of the frame support system and lateral bracing was not considered in this study.
- New roof system structures designed by others should account for the additional pressure loads.
- The capacity of an existing roof structure will be evaluated before installation of the walkway system.
- OSHA considerations for hand rail requirements have not been addressed.

We appreciate the opportunity to continue serving as your Facilities Engineering consultant. We look forward to working with you on this and other projects. If you have any questions or comments, please do not hesitate to contact us.

Sincerely,

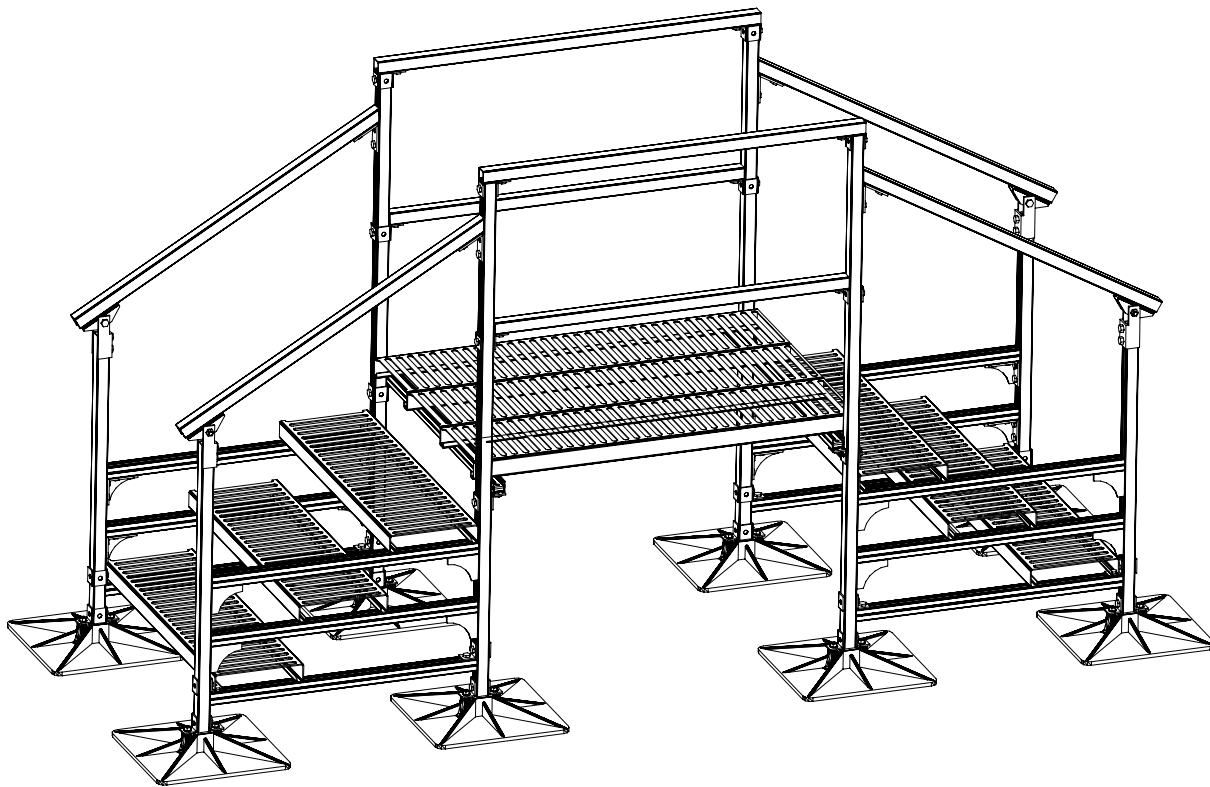
LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Ray F. Drexler, P.E.  
Project Engineer

Mark H. Hopmann, P.E.  
Principal Engineer



# CROSSOVER & PLATFORM SYSTEMS



# CROSSOVER SYSTEMS

## Standard System Specifications

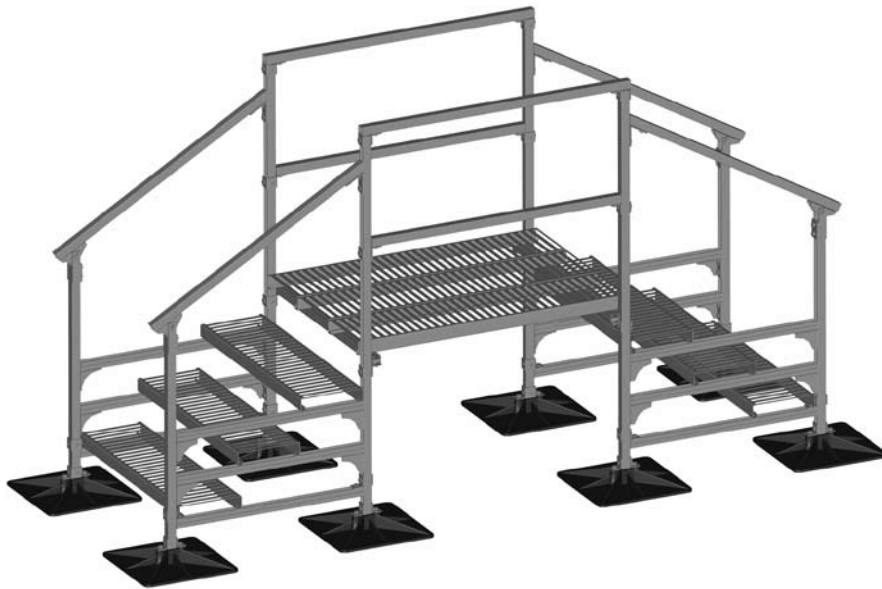
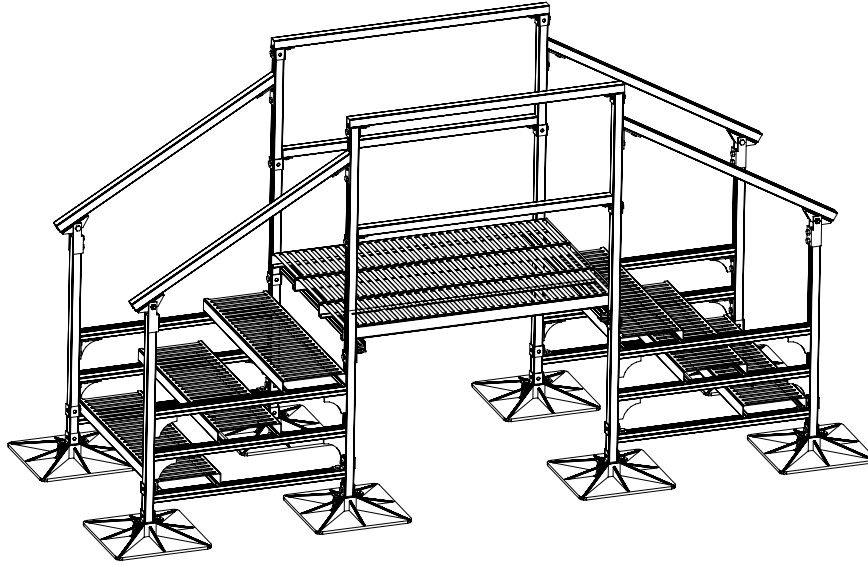
1. Crossover Systems routed across piping shall be supported off the roof by an engineered prefabricated Crossover System specifically designed to be installed directly on the roof without roof penetration, flashing or damage to the roofing material.
2. The system shall be designed to support all weight as required.
3. The system shall consist of the following:
  - a. Bases are to be made of High Density Polypropylene Plastics and other additives for UV protection. Material with inserts for channel or threaded rods as required.
  - b. The substructure is made of a 12 gauge back to back channel G-1012A, and is supported directly from the bases.
  - c. The grating material is made from mill-galvanized carbon steel.

Metal gauge:	14-ga. steel, 16-ga. steel, 18-ga. steel
Finish:	Mill-galvanized before fabrication, ASTM A525
Section Width:	12", 9", 6"
Channel Height:	1½", 2½", 3" and 4"
Flange Options:	FM, MM, FF
Surface condition:	MG – traction grip, MS – smooth
  - d. The handrail is assembled from a 12 gauge, 1½" channel G-5812.
4. All substructures and handrails shall be galvanized steel. Nuts, threaded rods and washers shall be electro-plated.
5. Crossover Systems shall be manufactured by PHP.

## Installation

1. Lay out isolation pads.
2. Place bases on isolation pads.
3. Insert preassembled steps into bases.
4. Attach grating to steps with hold-down clamps.
5. Attach intermediate and top handrails, if provided.

# CROSSOVER SYSTEMS



**Crossover Systems for Built-up, Single-ply and Sloped, Standing Seam Metal Roofs**

# PLATFORM SYSTEMS

## Standard System Specifications

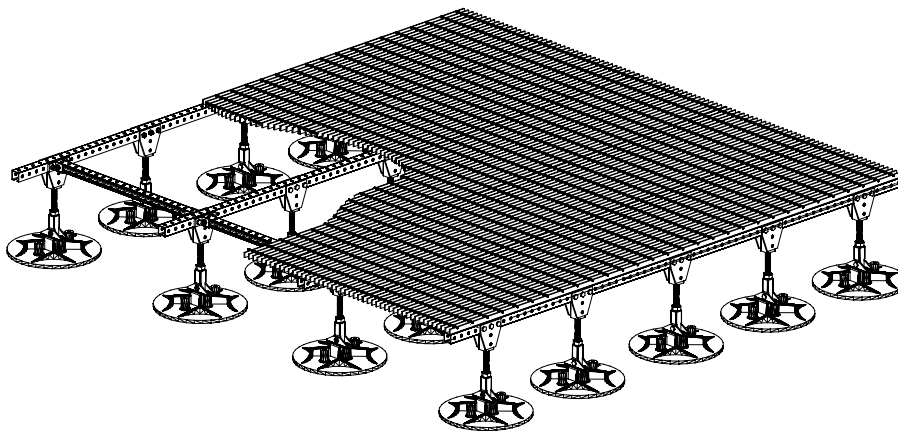
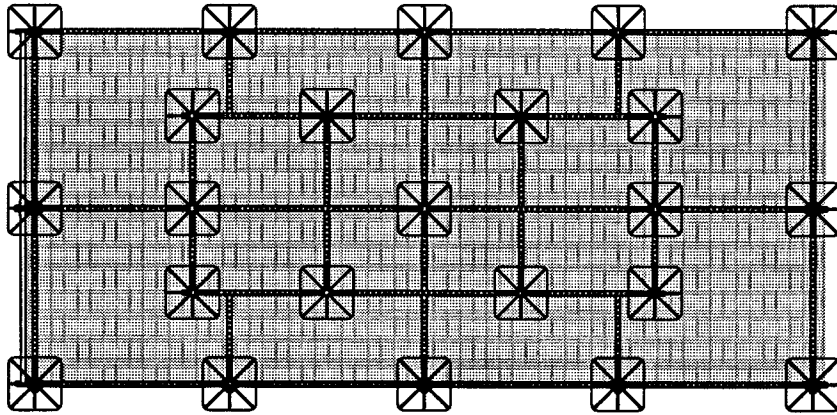
1. Standard Platform Systems shall be supported on the roof by an engineered, prefabricated PHP Platform System specifically designed to be installed directly on the roof without roof penetrations, flashings or damage to the roofing material.
2. The system shall be designed to support all weight as required.
3. The system shall consist of the following:
  - a. Bases are to be made of High Density Polypropylene Plastics and other additives for UV protection. Material with inserts for channel or threaded rods as required.
  - b. The substructure is made of a 12 gauge back to back channel G-1012A, or 1 $\frac{5}{8}$ " B22TH and 1 $\frac{7}{8}$ " BTS22TH channel, and is supported directly from the bases.
  - c. The grating material is made from mill-galvanized carbon steel.

Metal gauge:	14-ga. steel, 16-ga. steel, 18-ga. steel
Finish:	Mill-galvanized before fabrication, ASTM A525
Section Width:	12", 9", 6"
Channel Height:	1 $\frac{1}{2}$ ", 2 $\frac{1}{2}$ ", 3" and 4"
Flange Options:	FM, MM, FF
Surface condition:	MG – traction grip, MS – smooth
  - d. The handrail is assembled from a 12 gauge, 1 $\frac{5}{8}$ " channel G-5812.
4. All substructures and handrails shall be galvanized steel. Nuts, threaded rods and washers shall be electro-plated.
5. Platform Systems shall be manufactured by PHP.

## Installation

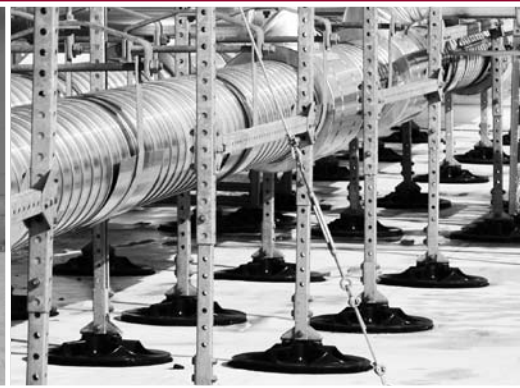
1. Lay out isolation pads.
2. Place bases on isolation pads.
3. Insert preassembled substructures into bases.
4. Attach grating to substructures with hold-down clamps.
5. Attach intermediate and top handrails, if provided.

# PLATFORM SYSTEMS



**Platform Systems for Media, Telecom and HVAC Applications**







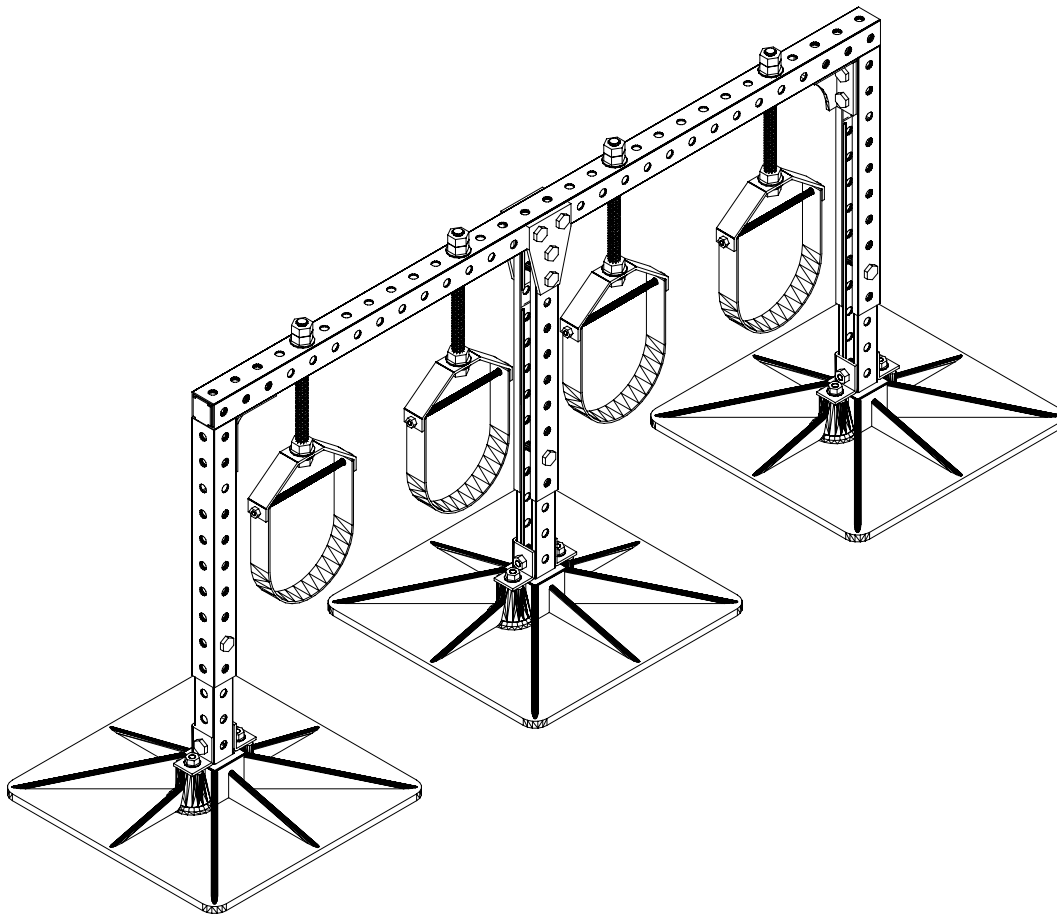
# GENERAL SPECIFICATIONS

2004 Edition/Division Numbers

Seven, Twenty-two, Twenty-three, Twenty-six and Twenty-seven

1994 Edition/Division Numbers

Seven and Fifteen



# GENERAL SPECIFICATIONS

## 1.1 Section Includes

A. Portable, non-penetrating, rooftop support systems for:

1. Piping
2. Ducting
3. Conduits and cables
4. HVAC equipment
5. Plumbing equipment
6. Telecommunications equipment
7. Industrial process equipment
8. Walkways, Crossovers & Platform Systems

*Seismic and High Wind application for items 1 thru 8 listed above.*

## 1.2 Related Sections

- A. Section 07 00 00 - Thermal & Moisture Protection
- B. Section 07 71 00 - Roof Specialties
- C. Section 07 72 00 - Roof Accessories
- D. Section 07 72 46 - Roof Walkways
- E. Section 07 76 00 - Roof Pavers
- F. Section 21 00 00 - Fire Suppression
  1. 21 05 29 - Hangers & Supports for Fire Suppression Piping & Equipment
  2. 21 05 48 - Vibration & Seismic Controls for Fire Suppression Piping & Equipment
- G. Section 22 00 00 - Plumbing
  1. 22 05 29 - Hangers & Supports for Plumbing, Piping & Equipment
  2. 22 05 48 - Vibration & Seismic Controls for Plumbing, Piping & Equipment
- H. Section 23 00 00 - Heating, Ventilating, and Air Conditioning (HVAC)
  1. 23 05 29 - Hangers & Supports for HVAC Piping & Equipment
  2. 23 05 48 - Vibration & Seismic Controls for HVAC Piping & Equipment
- I. Section 23 33 00 - Air Duct Accessories
- J. Section 26 00 00 - Electrical
- K. Section 27 00 00 - Communications

## 1.3 References

- A. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- B. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- C. ASTM D 1929 - Standard Test Method for Determining Ignition Temperature of Plastics
- D. MSS SP-58 - Pipe Hangers and Supports — Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry
- E. MSS SP-69 - Pipe Hangers and Supports — Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry

# GENERAL SPECIFICATIONS

## 1.4 System Description

- A. Piping on roof shall be supported by an engineered, prefabricated PHP System specifically designed to be installed on the roof without roof penetrations, flashing or damage to the roofing material. The system shall consist of Bases, made of High Density Polypropylene Plastics and other additives for UV protection, a HDG structural steel frame and suitable pipe hangers for the application. Nuts, threaded rods and washers shall be HDG Spring nuts and their bolts will be electro-plated. The system shall be custom designed to fit the piping and conduits to be installed and the actual conditions of service. Pipe supports shall be manufactured by PHP Systems & Design i.e. Portable Pipe Hangers (see 2.2 A).
- B. Ductwork on roof shall be supported by an engineered, prefabricated PHP-Duct System specifically designed to be installed on the roof without roof penetrations, flashing or damage to the roofing material. The system shall consist of Bases, made of High Density Polypropylene Plastics and other additives for UV protection, and a HDG structural steel frame. Nuts, threaded rods and washers shall be HDG Spring nuts and their bolts will be electro-plated. The system shall be custom designed to fit the load requirements that will be required. Duct supports shall be manufactured by PHP Systems & Design i.e. Portable Pipe Hangers (see 2.2 B).
- C. Elevated Walkway Systems routed across the roof shall be supported by an engineered, prefabricated PHP-Walkway System specifically designed to be installed on the roof without roof penetrations, flashing or damage to the roofing material. The system shall consist of Bases, made of High Density Polypropylene Plastics and other additives for UV protection, a galvanized structural steel frame, walkway planking, and handrail if required. Nuts, threaded rods and washers shall be HDG Spring nuts and their bolts will be electro-plated. The system shall be custom designed to fit the load requirements that will be required. Walkway Systems shall be manufactured by PHP Systems & Design i.e. Portable Pipe Hangers.
- D. PHP Telecommunication Platform Systems on the roof shall be supported by an engineered, prefabricated PHP Platform Systems specifically designed to be installed directly on the roof without roof penetration, flashing or damage to the roofing material. The system shall be designed to support all weight as required. The system shall consist of Bases, made of High Density Polypropylene Plastics and other additives for UV Protection, galvanized substructures, bar grating and handrails if required. Nuts, threaded rods and washers shall be HDG Spring nuts and bolts for spring nuts will be electro-plated. Telecommunications Platform Systems shall be manufactured by PHP Systems & Design i.e. Portable Pipe Hangers.
- E. Seismic and High Wind applications are available for all categories listed above. If required, PHP Systems & Design i.e. Portable Pipe Hangers can design a system for your Seismic and High Wind Application (See 2.2 E).

# GENERAL SPECIFICATIONS

## 1.5 Submittals

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: Submit all products proposed for use, describing physical characteristics and method of installation.
- C. Shop Drawings: Show installation layout, sizes of units and details of installation.
- D. Verification Samples: Actual samples of bases, each type of support, hanger and fasteners and no less than 12 inches (300 mm) of framing members.

## 1.6 Quality Assurance

- A. Manufacturer Qualifications: Company must specialize in manufacturing pipe support systems and have a minimum of eight years of documented experience.
- B. Installer Qualifications: Company must be approved by manufacturer and have a minimum of five years experience in installation of piping support systems.
- C. References: Submit list of references comprising no less than 10 installations that have been in use for a minimum of five years.
- D. Include contact name and phone numbers for each reference.
- E. Pre-Installation Meeting: After approval of submittals, but before beginning installation, conduct a meeting at the project site attended by the architect, contractor, and the installers of roofing, mechanical and electrical piping.
  - 1. The purpose of meeting is to describe in detail the installation process and to establish agreement, coordination and responsibilities. Call (800) 797-6585 to set up a meeting.
  - 2. Prepare detailed meeting report and distribute copies to the architect and all attendees.

## 1.7 Delivery, Storage, And Handling

- A. Deliver all materials to project site in manufacturer's original packaging, marked with manufacturer's name, product model names and catalog numbers, identification numbers, and other related information.
- B. Store materials under cover until needed for installation.

# GENERAL SPECIFICATIONS

## 1.8 Warranty

- A. See Section 01 78 00 - Closeout Submittals - for additional warranty requirements.
- B. Submit manufacturer's warranty that base materials will perform without failure for the same period as roofing warranty (up to twenty years) required under Division 7 roofing section.
- C. Limited Warranty: We guarantee to repair or replace, at our option, any products we find in our sole discretion to be structurally defective in material or workmanship for a period of five (5) years from date of delivery to purchaser. Such warranty specifically excludes repair of non-structural rust damage to products. Our obligation with respect to material found by us to be defective shall be limited to replacement or repair and in no event shall we be liable for transportation to or from our factory, installation, adjustments or any expenses or damages arising in connection with such material. PHP Systems & Design i.e. Portable Pipe Hangers accepts no liability for products not designed and laid out by PHP or for any alteration or modification to the system not authorized by PHP. No warranty expressed or implied shall cover defects caused by outside contractors/installers of the PHP System.

## 2.1 Manufacturers

- A. Acceptable Manufacturer: PHP Systems & Design i.e. Portable Pipe Hangers; 5534 Harvey Wilson Drive, Houston, Texas 77020. ASD.  
Tel: Toll-free (800) 797-6585 or Local (713) 672-5088. Fax: (713) 672-1170.  
www.portablepipehangers.com. Email: info@portablepipehangers.com
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.
- C. Substitutions must be submitted and approved seven days prior to date of pre-bid conference.

## 2.2 Applications

- A. Support pipes, conduit, cable trays and ducting, a minimum of 6 inches (150 mm) above roof surface.
- B. Support Spacing: 10 feet. MAXIMUM
- C. For Electrical and Gas Lines 2-1/2 inches (64 mm) in diameter or less, up to 10" above roof: Portable Pipe Hanger Model number: SS8.
- D. For Electrical and Gas Lines 3-1/2 inches (89 mm) in diameter or less, up to 16" above roof: Portable Pipe Hanger Model number PP10.
- E. For Gas Lines 4 to 6 inches (100-150 mm) in diameter, up to 12" above roof: Portable Pipe Hanger Model number RB18.
- F. For single Electrical and Gas Lines 3 to 8 inches (80-200 mm) in diameter: Portable Pipe Hanger Model number PS 1-2.
- G. For Multiple Lines: Portable Pipe Hanger Model number PSE custom.

# GENERAL SPECIFICATIONS

## 2.2 Applications (cont'd.)

1. Accessories for PSE Custom and Other Applications when required.
- H. On Sloped Roof Surfaces, Where slope exceeds 1/4 inch per foot (13 mm per 305 mm): Provide base with swivel for slope adjustment. Note: PHP approved bracing required when using base with swivel.
- I. Un-insulated Piping: Roller support or clevis hanger.
- J. Insulated Piping: Band hanger supported from horizontal channel or clevis hanger with Insulation Protection Shield.
- K. Conduit: Band hanger supported from horizontal channel.
- L. Bracing required when using base with swivel, when pipe exceeds 24" above roof, or when thermal expansion of pipe is excessive.
- M. For Ductwork: Portable Pipe Hanger Model number PPH-D – Goal Post style.
- N. For Ductwork: Portable Pipe Hanger Model number PPH-D – Enclosed style.
- O. Walkway, Crossover & Equipment Platform Access
  1. Portable Pipe Hangers Crossover Systems routed across the roof shall be supported off the roof by an engineered prefabricated PPH Walkway System specifically designed to be installed directly on the roof without roof penetration, flashing or damage to the roofing material.
  2. The system shall be designed to support all weight as required.
  3. The system shall consist of the following:
    - a. Bases are to be made of High Density Polypropylene plastics and other additives for UV protection.
    - b. The substructure is made of a 12 gauge back-to-back channel G-1012A, and are supported directly from the bases.
    - c. The grating material is made from mill-galvanized carbon steel. Metal Gauge: 14-ga. Steel or 18-ga. Steel. Finish: Mill-galvanized before fabrication, ASTM A525. Section Width: 12"(standard), 9", 6"., Channel Height: 1 1/2" or 2 1/2"(standard). Flange Options: FM or MM. Surface Condition: MG-traction grip or MS-smooth.
    - d. The handrail is assembled from a 12 gauge, 1 5/8" channel G-5812.
    - e. All substructures and handrails shall be galvanized steel. Spring nuts and their bolts will be electro-plated.
    - f. Elevated walkway systems shall be manufactured by PHP Systems & Design i.e., Portable Pipe Hangers.
- P. Telecom Platform Specifications:
  1. Portable Pipe Hangers Telecommunications Platform Systems: Equipment shall be supported by an engineered, prefabricated PHP Platform System specifically designed to be installed directly on the roof without roof penetration, flashing or damage to the roofing system.
  2. The Platform System shall be designed to support all weight as required.

# GENERAL SPECIFICATIONS

## 2.2 Applications (cont'd.)

3. The Platform System shall consist of the following:
  - A. Bases are to be made of High Density Polypropylene Plastics and other additives for UV protection.
  - B. Leveling assembly for height adjustment.
  - C. The substructure is made of a 12 gauge channel, and are supported directly from the bases.
  - D. The grating material is serrated. Bar grating type: WB-4, Finish: HDG, Section Width: As required, Bar grating height: 1", Surface condition: serrated.
  - E. The handrail is assembled from a 12 gauge, 1 5/8" channel, if required.
  - F. All substructures and handrails shall be galvanized steel. Nuts, threaded rods and washers shall be HDG Spring nuts and their bolts will be electro-plated.
  - G. Telecommunications Platform System shall be manufactured by PHP Systems & Design i.e., Portable Pipe Hangers.
  - H. Attachment of Base to Roof Surface when required for Seismic and High Wind Application.
  - I. No attachment to roof surface.
  - J. Adhesive attachment to roof surface.
  - K. Mechanically fastened to roof deck.

## 2.3 Materials

- A. Portable Support System: Engineered, portable system specifically designed for installation without the need for roof penetrations or flashings and without causing damage to the roofing membrane.
  1. Design system using high density/high impact polypropylene bases with anti-oxidants and carbon black for UV protection and framing for support is 1 5/8" B22TH or 1 7/8" BTS22TH.
  2. Custom design system to fit piping, conduits, equipment, or walkways to be installed and actual conditions of service and loading.
  3. Pipe Supports: Provide suitable hangers and supports.
  4. Duct and Equipment Supports: Factory fabricated to support exact duct sizes and equipment to be installed.
  5. Walkways and Platforms: Provide galvanized slotted metal grating, in configurations as indicated, and handrails where indicated.
- B. Bases: Injection molded high density/high impact polypropylene with UV-inhibitors and anti-oxidants, conforming to the following:
  1. Moisture Content: Negligible.
  2. Shrinkage/Swelling Due to Moisture: Negligible.
  3. Density: 55.8 lb/cu ft (894 kg/cu m).

# GENERAL SPECIFICATIONS

## 2.3 Materials (cont'd.)

4. Insect Resistance: No known insect damage potential.
  5. Chemical Resistance (oil, brake fluid, gasoline, diesel, antifreeze, battery acid and sulfuric acid: No visual or physical change apparent.
  6. Flammability: No ignition after 10 minutes, 25 kW/m, when tested in accordance with ASTM D 1929.
  7. Sized as required by loading conditions and as indicated on the drawings.
  8. Shop fabricated with inserts for square tubing or threaded rods as required.
  9. Color: Integral black color as molded.
  10. Bases for Mechanical Attachment: Sealant chamber around penetration point, with injection port for sealing after fastening; beveled lip for sealant bead around entire diameter.
  11. Do not use bases containing carbonated plastics, press molded recycled rubber and plastics, steel, stainless steel or any injection molded threaded receivers.
- C. Steel Framing:
1. Channel Types: 1-5/8 inch (41.3 mm) B22TH or 1-7/8 inch (47.6 mm) BTS22H, as required for loading conditions.
  2. Thickness: 12 gage (2.7 mm).
  3. Form: Roll-formed 3-sided channel, perforated with 9/16 inch (14.3 mm) holes at 1-7/8 inch (47.6 mm) centers on three sides.
  4. Finish: Hot dip galvanize in accordance with ASTM A 123 after fabrication, free of roughness, whiskers, unsightly spangles, icicles, runs, barbs, sags, droplets and other surface blemishes.
  5. Do not use tubing or tube steel.
- D. Stainless Steel Framing:
1. Channel Types: 1-5/8 inch (41.3 mm) or 1-7/8 inch (47.6 mm), as required for loading conditions.
  2. Thickness: 12 gage (2.7 mm).
  3. Form: Roll-formed 3-sided channel.
  4. Finish: Mill finish.
  5. Do not use tubing or tube steel.
- E. Pipe Supports and Hangers: Conform to MSS SP-58 and MSS SP-69 and as follows:
1. Fabricated of carbon steel where framing is carbon steel; fabricated of stainless steel where framing is stainless steel; finished same as framing.
  2. Sizes 2-1/2 inch (63 mm) and smaller: Single roller supports for piping subject to expansion and contraction; 3-sided channels and pipe clamps.
  3. Sizes 3 inch (76 mm) and larger: Rollers, clevis hangers, or band hangers, to allow for expansion and contraction without movement of the bases or framing.



# GENERAL SPECIFICATIONS

## 2.3 Materials (cont'd.)

- F. Accessories: Clamps, bolts, nuts, washers and other devices as required for a complete system.
  - 1. Carbon Steel: Hot-dip galvanized in accordance with ASTM A 153/A 153M.
  - 2. Stainless Steel: Mill finish.
  - 3. For Mechanical Fastening to Deck: On wood and steel decks, use bolts with steel plate to attach to deck; on concrete decks use threaded rods and epoxy drop-in anchors, with rod embedded at least 1-3/4 inches (44 mm) into concrete.

## 3.1 Examination

- A. Verify that roofing system is complete and that roof surfaces are smooth, flat and ready to receive work of this section.
- B. Verify that roof surface temperature is at minimum 60 degrees F (15.5 degrees C), for proper adhesive performance.

## 3.2 Preparation

- A. Clean surfaces of roof in areas to receive portable support bases.
- B. Sweep loose gravel from gravel surfaced roofs.
- C. Remove dirt, dust, oils and other foreign materials.
- D. Use care in handling portable support system components during installation to avoid damage to roofing, flashing, equipment or related materials.

## 3.3 Installation

- A. Pipe, Cable, Conduit and Equipment Support Systems:
  - 1. Locate bases and support framing as indicated on drawings and as specified herein. Provide complete and adequate support of all piping, ducts and conduit, whether or not all required devices are shown.
  - 2. The use of wood for supporting piping is not permitted.
  - 3. Provide supports spaced so deflection of piping does not exceed 1/240 of span.
  - 4. Install framing at spacing indicated, but in no case at greater than 10 ft (3 m) on center.
  - 5. Accurately locate and align bases.
  - 6. Sweep off loose gravel, if present.
  - 7. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system. Isolation pads are added protection for the roofing system and are placed between the roof and base.
  - 8. After isolation pads are installed, place bases on pads.
  - 9. Adhere or mechanically attach if required by code.
  - 10. Where applicable, replace gravel around bases.

# GENERAL SPECIFICATIONS

## 3.3 Installation (cont'd.)

11. Set framing posts into bases and attach framing post to base bracket with bolt provided.
  12. Use galvanized fasteners for galvanized framing and stainless steel fasteners for stainless steel framing.
- B. Duct Support Systems
1. All PHP Systems are as pre-assembled as possible.
  2. Sweep off loose gravel, if present.
  3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
  4. Determine spacing of supports.
  5. After isolation pads are installed, place bases on pads.
  6. Place pre-assembled support into bases and attach framing post to base bracket with bolt provided then adjust as needed. Note, support shall be adjustable to maintain existing elevation and slope.
- C. Walkways, Crossovers and Platforms:
1. Install substructures at spacing indicated for walkway systems, but not greater than 5 ft (1.5 m) on center.
  2. Accurately locate and align bases.
  3. Consult manufacturer of existing or new roofing system regarding type of isolation pads required for their roofing system.
  4. After pads are installed, place bases on pads.
  5. Adhere or mechanically attach if required by code.
  6. Where applicable, replace gravel around bases.
  7. Set legs of substructures into bases.
  8. Layout and fasten planking to substructures.
  9. Where handrails are required, install as follows:
    - a. Install intermediate rails without tightening.
    - b. Make minor adjustments as needed, such as spacing of substructures to accommodate intermediate handrails, and install hold-downs.
    - c. Secure intermediate handrails and install top handrails.
- D. Telecommunications
1. All PHP systems are as pre-assembled as possible.
  2. Sweep off loose gravel, if present.
  3. Consult manufacturer of existing or new roofing system regarding type of walk pads required for their roofing system.
  4. Determine spacing of supports.
  5. After pads are installed, place bases on pads.
  6. Attached pre-assembled support to bases and adjust as needed. Note, support shall be adjustable to maintain existing elevation and slope.
  7. Lay out bar grating on substructures and attach.

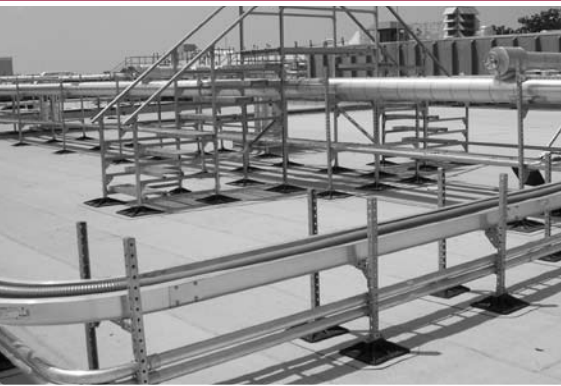
# GENERAL SPECIFICATIONS

## 3.4 Field Quality Control

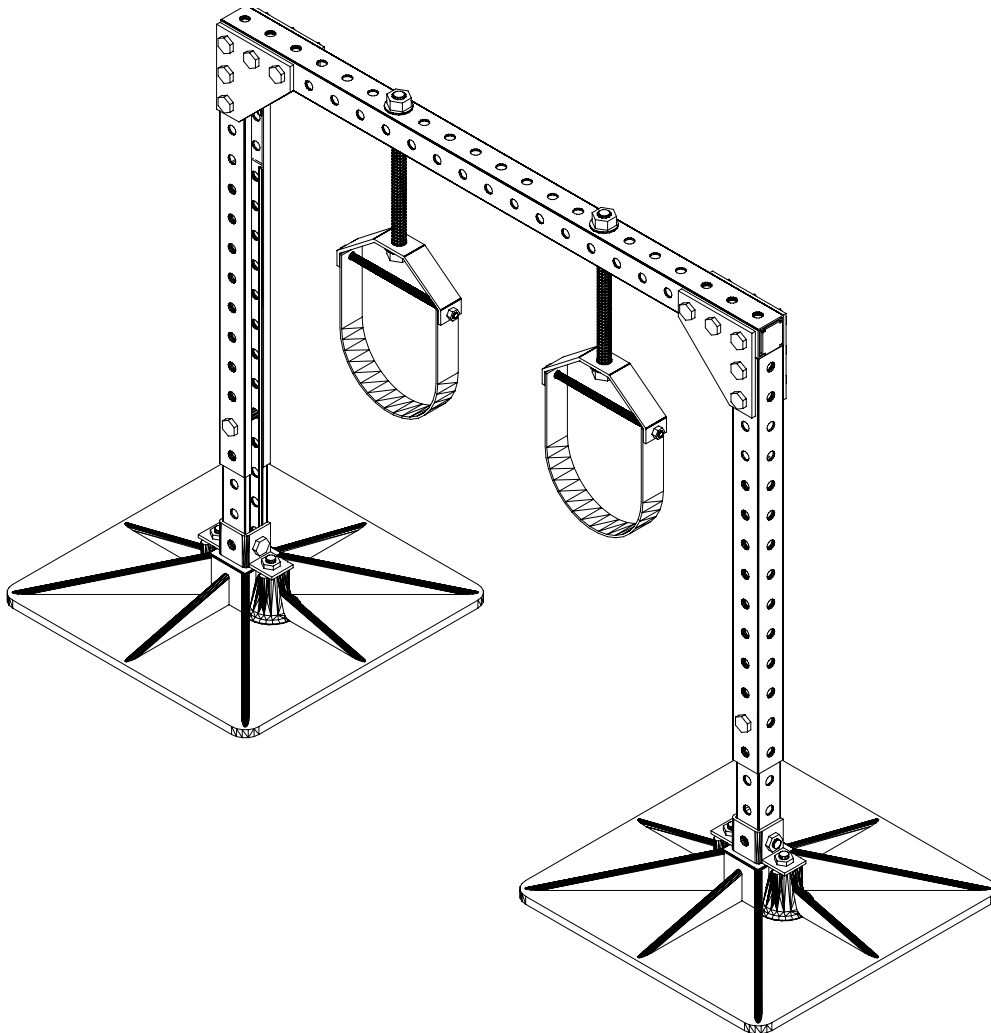
- A. When requested by the Architect, provide a factory-trained representative of the manufacturer to visit the site while the work is in progress to assure that the installation conforms to the design requirements and the manufacturer's installation requirements.

## 3.5 Cleaning and Protection

- A. Remove all packaging, unused fasteners, adhesive and other installation materials from the project site.
- B. Remove adhesive from exposed surfaces of supports and bases, and leave the work area in clean condition.
- C. Provide protection as required to leave the work area in undamaged condition at the time of completion.



# ENGINEERING TABLES



# ENGINEERING TABLES

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<b>Table 2</b>	Product Information - Standard Bases
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Graphs of the test data of some of the above tests are included in the Appendix.

# ENGINEERING TABLES

**Table 1 - Material Properties**

CHARACTERISTIC	TEST	RESULTS
Color	Visual	Black
Hardness (test averages) at -30° Fahrenheit at 73° Fahrenheit at 130° Fahrenheit	ASTM D2240-84 (See Table 4)	D70.6 D63.5 D55.1
Ultimate Compressive Strength (test averages) at -30° Fahrenheit at 73° Fahrenheit at 130° Fahrenheit	ASTM D695-91 (See Table 5)	5857 psi 5505 psi 5311 psi
Ultimate Flexural Strength (Yield) (test averages) at -30° Fahrenheit at 73° Fahrenheit at 130° Fahrenheit	ASTM D790-86 (Procedure B)	4961 psi 4240 psi 2641 psi
Modules of Elasticity (Averages based on Flexure) at -30° Fahrenheit at 73° Fahrenheit at 130° Fahrenheit		36.6 x 10 <sup>4</sup> psi 28.0 x 10 <sup>4</sup> psi 14.1 x 10 <sup>4</sup> psi

**Abbreviations:** psi = pounds per square inch

**Table 2 - Standard Bases**

	SMALL BASE	MEDIUM BASE	LARGE BASE
Dimensions (inches)	9¾" by 15¾"	12" x 12"	18" x 18"
Base Area	154 square inches	144 square inches	324 square inches
Weight (base only)	4.3 pounds	3.7 pounds	7.8 pounds

# ENGINEERING TABLES

**Table 3 - Maximum Allowable Loading by Pipe Hanger**

DECK INSULATION	STRESS	SMALL BASE	MEDIUM BASE	LARGE BASE
Expanded Polystyrene	5 psi	770 pounds	720 pounds	1,620 pounds
Glass/Mineral Fiber	5 psi	770 pounds	720 pounds	1,620 pounds
Polyisocyanurate	5 psi	770 pounds	720 pounds	1,620 pounds
Extruded Polystyrene	6 psi	924 pounds	864 pounds	1,944 pounds
Fiber Board	6 psi	924 pounds	864 pounds	1,944 pounds
Perlite	17.5 psi	2,695 pounds	2,520 pounds	5,670 pounds
Cellular Glass	50 psi	7,700 pounds	7,200 pounds	16,200 pounds

Please note that the placement of individual bases must be reviewed by a structural engineer to ensure that the roof structure is not overloaded.

Based on a safety factor of 2, against published minimum ultimate values of insulation compression strength (NRCA Commercial Low-Slope Roofing Materials Guide, 1994 Edition). Designer must also ensure adequacy against punching resistance and overall structural integrity of the roof on which the assembly is placed. Resultant stresses from lateral loads on pipes may result in higher stresses in substrate than plain gravity loads.

**Table 4 - Hardness Test Values**

TEST NUMBER	TEST SPECIMEN TEMPERATURE		
	-30° F	73° F	130° F
1	70.4	63.6	55
2	70.8	63	55.6
3	70.6	63.8	54.8
AVERAGE	70.6	63.5	55.1

Abbreviations: °F = degrees Fahrenheit



# ENGINEERING TABLES

**Table 5 - Ultimate Compression Strengths**

**Test Method: ASTM D695-91**

TEST NUMBER	TEMPERATURE DURING TEST		
	-30°F	73°F	130°F
1	5,592 psi	5,524 psi	5,380 psi
2	5,880 psi	5,548 psi	5,212 psi
3	6,100 psi	5,444 psi	5,340 psi
AVERAGE	5,857 psi	5,505 psi	5,311 psi

Abbreviations: oF = degrees Fahrenheit  
psi = pounds per square inch

**Table 6 - Flexural Stresses**

	TEMPERATURE DURING TEST					
	-30°F		73°F		130°F	
#	Fb (psi)	E x 10 <sup>4</sup> (psi)	Fb (psi)	E x 10 <sup>4</sup> (psi)	Fb (psi)	E x 10 <sup>4</sup> (psi)
1	5,210	36.2	4,485	35.2	3,031	14.8
2	4,608	35	4,030	22.5	2,497	18.5
3	5,064	38.6	4,205	26.3	2,394	9.1
AVERAGE	4,961	36.6	4,240	28	2,641	14.1

Abbreviations: lb = pound  
# = number  
oF = degrees Fahrenheit  
psi = pounds per square inch  
Avg = average  
Failure as no increase in load capacity  
Fb = Maximum Stress at Extreme Fiber in Bending  
 $Fb = 3P_{max}L/2bh^2$   
L = span length (16 inches)  
b = beam width (6 inches)  
h = beam height (1.25 inches)  
E = modules of elasticity  
Lease values of tests

# ENGINEERING TABLES

**Table 7 - Ultimate Punching Shear Resistance Loads  
(Pounds/Inch Deflection)**

BASE TYPE	TEST #	TEMPERATURE OF TEST SPECIMEN		
		-30°F	73°F	130°F
Small Base (15¾" x 9¾")	Posts 1	4,980/.20	9,910/.23	8,560/.6
	Pipe Support 2	6,180/.30	9,850/.21	9,640/.6
	3	5,270/.23	9,870/.22	7,740/.6
Medium Base (12" x 12")	1	9,980/.43	9,000/.63	7,630/1.0
	2	9,910/.43	9,670/.63	7,480/1.0
	3	9,930/.34	9,960/.58	9,340/1.0
Large Base (18" x 18")	1	7,700/.71	6,940/1.1	4,810/1.0
	2	9,350/.96	6,550/.96	6,130/1.42
	3	8,810/.82	7,220/1.38	5,580/1.28
Small Base (15¾" x 9¾")	Roller 1	4,030/.16	3,510/.15	3,180/.22
	Pipe Support 2	3,550/.26	4,110/.18	2,790/.21
	3	3,580/.20	3,890/.16	3,280/.26
Small Base (15¾" x 9¾")	Roller 1	3,060/.23	3,070/.36	2,900/.50
	Pipe Support 2	3,420/.24	3,220/.24	2,900/.46
	3	2,960/.30	2,960/.31	3,000/.44

**NOTE:** The deflection noted in the values for the roller and beam pipe support are a combination of deflection of the pipe support assembly and the pipe hanger base.

**Abbreviations:** # = Number

°F = degrees Fahrenheit

# ENGINEERING TABLES

**Table 8 - Typical Roof Loads and Resulting Gravity  
(Only Bearing Stresses)**

Medium Size Portable Pipe Hanger Assembly

Base Dimensions: 9¾" x 15¾"

Base Weight: 4.3 lb each, measured

Frame Weight: 9 lb, assumed

Pipe Hanger weight (4 to 6"): 4 lb each

PIPE SIZE	# OF PIPES	CONTENTS OF PIPE	SPACING OF PIPE SUPPORTS		
			6 FOOT	8 FOOT	10 FOOT
4 inch	2	WATER	115 lb (0.75 psi)	147 lb (0.96 psi)	177 lb (1.15 psi)
6 inch	2	WATER	207.3 lb (1.35 psi)	267.3 lb (1.74 psi)	327.3 lb (2.13 psi)

**Abbreviations:** # = number  
lb = pounds  
psi = pounds per square inch

# ENGINEERING TABLES

**Table 9 - Typical Roof Loads and Resulting Gravity  
(Only Bearing Stresses)**

Medium Size Portable Pipe Hanger Assembly

Base Dimensions: 12" by 12"

Base Weight: 8 lb each assumed, 3.71 lb measured, 16 lb per assembly

Frame Weight: 9 lb

Pipe Hanger Weight (4 to 6"): 4 lb each

PIPE SIZE	# OF PIPES	CONTENTS OF PIPE	SPACING OF PIPE SUPPORTS		
			6 FOOT	8 FOOT	10 FOOT
4 inch Pipe	1	GAS	94 lb (0.36 psi)	115 lb (0.44 psi)	139 lb (0.53 psi)
		WATER	127 lb (0.49 psi)	159 lb (0.61 psi)	189 lb (0.73 psi)
	2	GAS	163 lb (0.63 psi)	205 lb (0.79 psi)	253 lb (0.97 psi)
		WATER	229 lb (0.88 psi)	293 lb (1.1 psi)	353 lb (1.4 psi)
	3	GAS	232 lb (0.89 psi)	295 lb (1.1 psi)	367 lb (1.4 psi)
		WATER	331 lb (1.3 psi)	427 lb (1.7 psi)	519 lb (2.0 psi)
6 inch Pipe	1	GAS	139 lb (0.53 psi)	179 lb (0.69 psi)	219 lb (0.84 psi)
		WATER	219 lb (0.84 psi)	279 lb (1.1 psi)	339 lb (1.3 psi)
	2	GAS	253 lb (0.97 psi)	333 lb (1.3 psi)	413 lb (1.6 psi)
		WATER	413 lb (1.6 psi)	533 lb (2.1 psi)	653 lb (2.51 psi)
	3	GAS	376 lb (1.4 psi)	487 lb (1.9 psi)	607 lb (2.3 psi)
		WATER	607 lb (2.33 psi)	787 lb (3.0 psi)	967 lb (3.7 psi)

Abbreviations: lb: pounds  
psi: pounds per square inch

# ENGINEERING TABLES

**Table 10 - Typical Roof Loads**

**Large Size Portable Pipe Hanger Assembly**

**Nominal Base Dimensions: 18" by 18" (calculations based on 17" X 17")**

**Base Weight: 13 lb each, 26 per assembly**

**Frame Weight: 16 lb**

**Hanger weight: 4 lb each ( 4" and 6"); 16 lb each (8"); 20 lb each (est) (10" and 12")**

PIPE SIZE	NUMBER OF PIPES	CONTENTS OF PIPE	SPACING OF PIPE SUPPORTS		
			6 FEET	8 FEET	10 FEET
4 inch	1	GAS	111 lb (0.19 psi)	132 lb (0.23 psi)	156 lb (0.27 psi)
		WATER	144 lb (0.25 psi)	176 lb (0.31 psi)	206 lb (0.36 psi)
	2	GAS	180 lb (0.32 psi)	222 lb (0.39 psi)	270 lb (0.47 psi)
		WATER	264 lb (0.43 psi)	310 lb (0.54 psi)	376 lb (0.65 psi)
	3	GAS	249 lb (0.44 psi)	312 lb (0.55 psi)	384 lb (0.67 psi)
		WATER	348 lb (0.61 psi)	444 lb (0.78 psi)	534 lb (0.94 psi)
6 inch	1	GAS	156 lb (0.27 psi)	196 lb (0.34 psi)	236 lb (0.41 psi)
		WATER	236 lb (0.41 psi)	296 lb (0.52 psi)	356 lb (0.62 psi)
	2	GAS	270 lb (0.47 psi)	350 lb (0.61 psi)	430 lb (0.75 psi)
		WATER	430 lb (0.75 psi)	550 lb (0.96 psi)	670 lb (1.2)
	3	GAS	384 lb (0.67 psi)	504 lb (0.88 psi)	624 lb (1.1 psi)
		WATER	624 lb (1.1 psi)	804 lb (1.4 psi)	984 lb (1.7 psi)
8 inch	1	GAS	228 lb (0.40 psi)	288 lb (0.51 psi)	348 lb (0.61 psi)
		WATER	358 lb (0.63 psi)	458 lb (0.80 psi)	558 lb (0.98 psi)
	2	GAS	414 lb (0.73 psi)	534 lb (0.94 psi)	654 lb (1.2 psi)
		WATER	674 lb (1.2 psi)	874 lb (1.5 psi)	1,074 lb (1.9 psi)
10 inch	1	GAS	302 lb (0.53 psi)	382 lb (0.67 psi)	472 lb (0.83 psi)
		WATER	512 lb (0.90 psi)	662 lb (1.2 psi)	812 lb (1.4 psi)
	2	GAS	562 lb (0.99 psi)	722 lb (1.3 psi)	902 lb (1.6 psi)
		WATER	982 lb (1.7 psi)	1,282 lb (2.2 psi)	1,582 lb (2.8 psi)
12 inch	1	GAS	362 lb (0.64 psi)	462 lb (0.81 psi)	562 lb (0.99 psi)
		WATER	652 lb (1.1 psi)	852 lb (1.5 psi)	1,052 lb (1.8 psi)

# ENGINEERING TABLES

**Table 11 - Loads: Standard Galvanized Pipe**

PIPE DIAMETER (NOMINAL)	CONTENTS	WEIGHT (Pipe and contents)	SPACING OF PIPE SUPPORTS		
			6'	8'	10'
4"	GAS	10.79 plf	65 lb	86 lb	110 lb
	WATER	16.30 plf	98 lb	130 lb	160 lb
5"	GAS	14.62 plf	88 lb	117 lb	150 lb
	WATER	23.28 plf	140 lb	190 lb	230 lb
6"	GAS	18.98 plf	110 lb	150 lb	190 lb
	WATER	31.49 plf	190 lb	250 lb	310 lb
8"	GAS	28.56 plf	170 lb	230 lb	290 lb
	WATER	50.24 plf	300 lb	400 lb	500 lb
10"	GAS	40.50 plf	240 lb	320 lb	410 lb
	WATER	74.60 plf	450 lb	500 lb	750 lb
12"	GAS	49.60 plf	300 lb	400 lb	500 lb
	WATER	98.60 plf	590 lb	790 lb	990 lb

**Abbreviations:**      **lb = pounds**  
                                  **plf = pounds per linear foot**

# ENGINEERING TABLES

**Table 12 - Roof Deck Insulation Compression Strengths**

INSULATION TYPE	UNIT WEIGHT	COMPRESSIVE STRENGTH
Expanded Polystyrene	1.0 pcf	10 to 14 psi
	1.25 pcf	13 to 18 psi
	1.5 pcf	15 to 21 psi
	2.0 pcf	25 to 33 psi
Extruded Polystyrene	1.3 to 4.1 pcf	12 to 60 psi
Glass Fiber/Mineral Fiber	10 to 15 pcf	10 psi
Cellular Glass	8.5 pcf	100 psi
Fiberboard	—	12 to 18 psi
Perlite	10 to 13 pcf	35 to 40 psi
Polyisocyanurate	—	10 to 25 psi

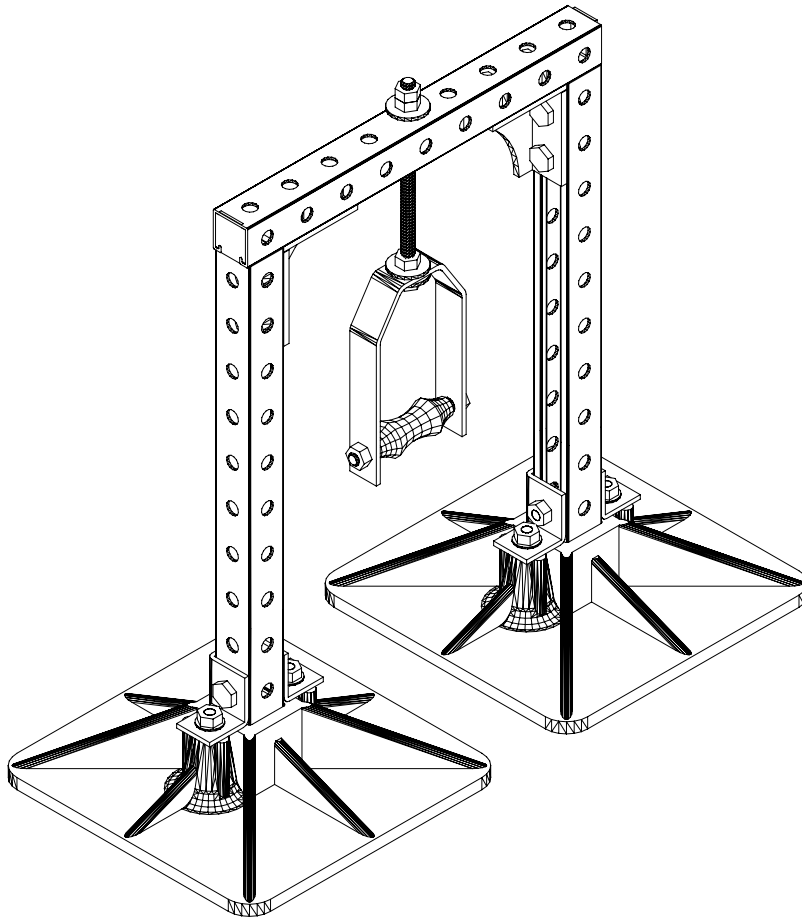
**Source:** National Roofing Contractors Association, Commercial Low-Slope Roofing Materials Guide, 1994 Edition

**Abbreviations:** psi: pounds per square inch  
pcf: pounds per cubic foot





# WIND RESISTANCE AND SEISMIC TABLES





# Dubek International Group

Environmental Division      Corrosion Division

October 26, 1998

Mr. Art Valentz  
Portable Pipe Hangers  
5534 Harvey Wilson Drive  
Houston, Texas 77020


Dear Art:

Our spotless reputation depends in great measure on the quality of the product principals like you make. The better the quality of your product the better the acceptance in our market.

Because of the high quality and craftsmanship of the portable pipe hangers we sold to SKB, Searle in Caguas and Searle in Barceloneta they all had absolutely no problem with the winds that the devastating hurricane Georges imposed on them.

We called the owners to check on the condition of the hangers and all they had to say was thank you for such a well made product. We all thank you very much and congratulate you for passing Georges test with high grades!!!! Keep up the good work!!!!

Best wishes,  
Dubek International Group, Inc.

  
Santiago R. Toro  
President

P.O. Box 19474, Fernández Juncos Sta., San Juan, Puerto Rico 00910  
Tel. (787) 751-5868 Fax (787) 767-8290  
Compuserve: 104355,2703 Internet: dubek@coquí.net

# WIND RESISTANCE & SEISMIC TABLES

**Table 1: Uplift Loading Test Results**

TEST NO.	FAILURE LOAD (lbf)	BASE CROSS SECTION AREA (sq. inch)	PRESSURE (psi)	PRESSURE (psf)	LOAD TYPE
1	1,400	324	4.32	622.22	Uplift
2	1,450	324	4.48	644.44	Uplift
3	1,400	324	4.32	622.22	Uplift
4	1,300	324	4.01	577.78	Uplift
5	1,000	324	3.09	444.44	Uplift
6	1,450	324	4.48	644.44	Uplift

**Table 1A: Uplift Loading Test Results**

TEST	LOAD TYPE	ULTIMATE FAILURE LOAD (lb)	VERTICAL DISPLACEMENT AT FAILURE	COMMENTS
1	Uplift	1,400 lb	4 in	Failure in insulation board. All base sheet fasteners remained secure.
2	Uplift	1,450 lb	3 1/8 in	Failure in insulation board. One base sheet fastener pulled out.
3	Uplift	1,400 lb	3 1/4 in	Failure of base sheet fasteners in pull out. Note that one of the fasteners was installed in the crack between plywood sheets.
4	Uplift	1,300 lb	3 in	No isolator pad installed. Failure in insulation board. All base sheet fasteners remained secure.
5	Uplift	1,000 lb	2 1/2 in	Pin connector in base assembly failed. No apparent distress in roof assembly at time of failure.
6	Uplift	1,450 lb	3 3/8 in	Failure in insulation board. One base sheet fastener partially pulled out.
Average		1,333 lb	3.2 in	
Standard Deviation		172 lb	0.5 in	
Coefficient of Variation		12.90%	15.40%	

# WIND RESISTANCE & SEISMIC TABLES

**Table 2: Fastener Pull-Out Resistance**

TEST NUMBER	PULL-OUT RESISTANCE
1	74 lbs
2	55 lbs
3	72 lbs
4	82 lbs
5	52 lbs
6	57 lbs
7	55 lbs
8	62 lbs
9	59 lbs
10	78 lbs
AVERAGE	64.6 lbs
STANDARD DEVIATION	10.9
COEFFICIENT OF VARIATION	16.80%

# WIND RESISTANCE & SEISMIC TABLES

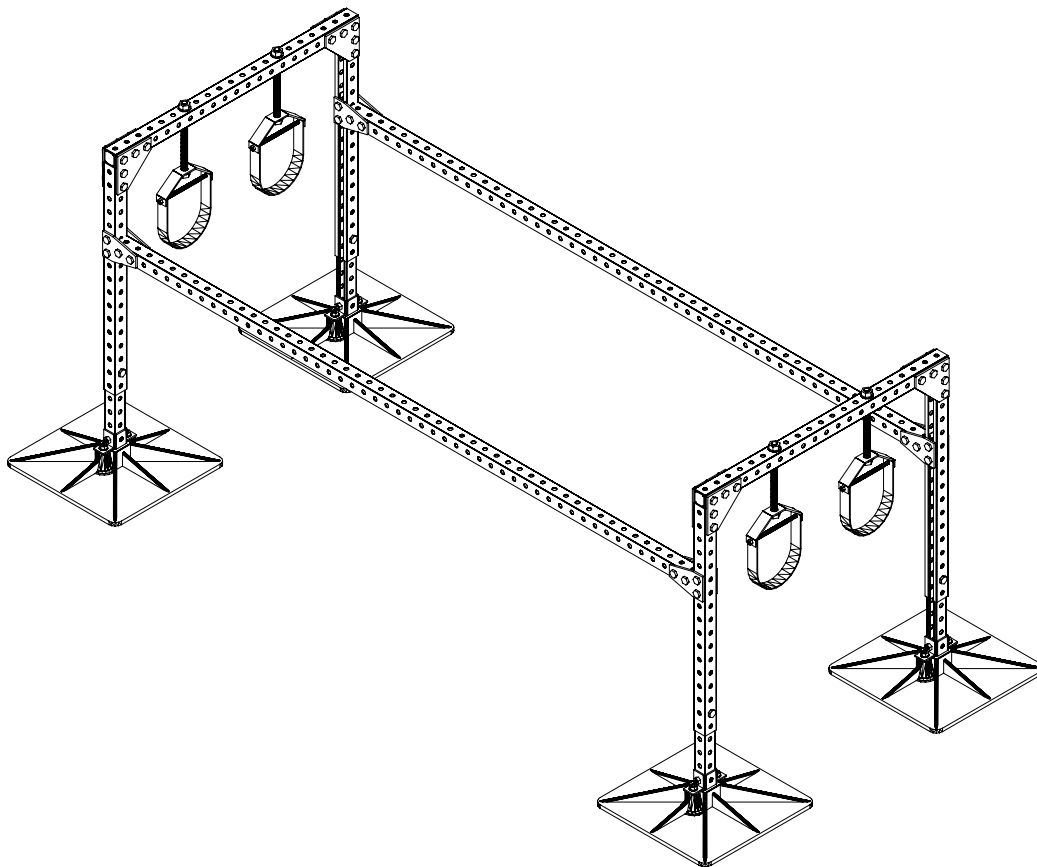
## Test Data

1. Wind Resistance Test (KEI) 1994
2. Uplift Load Test (KEI) 1998  
(Backup for Wind Resistance Test 1994)
3. Evaluation of Overturning (Law Eng.) 1996
4. Walkway System Support Pressure Tables (Law Eng.) 1997
5. Support Pressure Check (Law Eng.) 1997
6. Additional Pad Systems (Law Eng.) 1998
7. Wind Uplift (Law Eng.) 2000

*Test Data Reports available upon request.*



# SUGGESTED ANNUAL MAINTENANCE



# SUGGESTED ANNUAL MAINTENANCE

## PS/PSE Custom Frames: For 3" & larger Gas, HVAC, & Electrical Pipes

Visual Inspection – Look for the following:

- A. Loose or missing hangers in the PS/PSE Frame (adjust or replace as necessary).
- B. Check to determine pipe is properly resting in pipe hanger. Adjust all-thread up or down as necessary.
- C. Frames supporting pipe are to be perpendicular to pipe, and hangers are to be directly under load-bearing horizontal member.
- D. Brush any visible rust with a wire brush and spray with a Cold Galvanizing Compound.
- E. Check bases for any visible manufacturer's defects and/or deterioration.
- F. Visually confirm pipe is level throughout the entire pipe run.
- G. Confirm the proper spacing for each pipe support and verify accuracy of the spacing.
- H. Make sure base is located completely on pad underneath base.

## PP10 with Channel & PP10 with Roller: For 2½" & smaller Gas & Conduit Lines

Visual Inspection – Look for the following:

- A. Check to determine that the pipe is properly resting on the support. Adjust if needed.
- B. Brush any visible rust with a wire brush and spray with a Cold Galvanizing Compound.
- C. Check bases for any visible manufacturer's defects and/or deterioration.
- D. Confirm the proper spacing for each pipe support and verify accuracy of the spacing.

## Equipment Stands: For Air Conditioning & Air Handling Units

Visual Inspection – Look for the following:

- A. Check each Corner Support & Center Support to determine if each support is load-bearing. Adjust if needed.
- B. Brush any visible rust with a wire brush and spray with a Cold Galvanizing Compound.
- C. Check bases for any visual manufacturer's defects and/or deterioration.
- D. Confirm unit is level.



# SUGGESTED ANNUAL MAINTENANCE

## Duct Supports: For Roof Mounted Air Ducts

Visual Inspection – Look for the following:

- A. Determine that each duct is being properly supported by each duct support. Adjust if needed.
- B. Brush any visible rust with a wire brush and spray with a Cold Galvanizing Compound.
- C. Check bases for any visible manufacturer's defects and/or deterioration.
- D. Confirm the proper spacing for each duct support and verify accuracy of the spacing.

## Walkway Systems, Crossovers, & Platforms

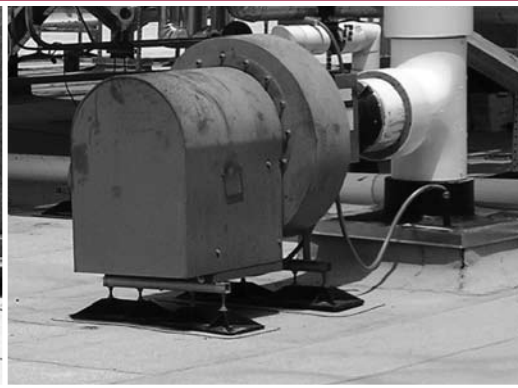
Visual Inspection – Look for the following:

- A. Brush any visible rust with a wire brush and spray with a Cold Galvanizing Compound.
- B. Check bases for any visible manufacturer's defects and/or deterioration.
- C. Confirm unit is level.
- D. Check Hold Down Clips on grating. Tighten where needed.
- E. Check unit for any loose connections in area of high traffic use.

## System Modifications:

Before any additional pipe is added or any modifications are made to any PHP System, please call 1-800-797-6585 for technical assistance.

Any modification to any PHP System could result in voiding of warranty.



# AFFILIATIONS



# PARTIAL CUSTOMER LIST

ALBERTSON'S	BOISE, ID.
BAE SYSTEMS	MOJAVE, CA.
BAXTER MEDICAL	CHICAGO, IL.
BAYER	MYERSTOWN, PA./PITTS, PA.
BROOKHAVEN NATIONAL LABS	UPTON, NY.
BROWN & ROOT SERVICES CORP	HOUSTON, TX.
BWX TECHNOLOGIES	LYNCHBURG, VA.
CAMBRO MANUFACTURING	HUNINGTON BEACH, CA.
CHEVRON ENERGY SOLUTIONS	PASADENA, CA.
CHICAGO FIELD MUSEUM	CHICAGO, IL.
CHICAGO FIRE STATIONS	CHICAGO, IL.
CINGULAR WIRELESS	EL PASO, TX.
CLEARWIRE	KIRKLAND, WA.
DANNON FOODS	TARRYTOWN, NY.
FLORIDA DEPT. OF CORRECTIONS	OCALA, FL.
GENERAL MOTORS	MANSFIELD/ LORDSTOWN, OH.
	/WARREN, MI.
GLAXO SMITH KLINE	CIDRA, PR.
HEB	SAN ANTONIO, TX.
HONEYWELL	HOUSTON, TX.
HOOSIER ENERGY CO	LOOMINGTON, IN.
HOUSTON INDEPENDENT SCHOOL DIST.	HOUSTON, TX.
KRAFT FOODS	ALLENTOWN, PA.
LOS ANGELES UNIFIED SCHOOL DISTRICT	LOS ANGELES, CA.
M.W. SAUSSE	VALENCIA, CA.
MCMASTER CARR	CHICAGO, IL.
MERCK PHARM	WEST POINT, PA.
ORLANDO UTILITIES COMMISSION	ORLANDO, FL.
PFIZER PHARM	NEW HAVEN, CT.
PORT AUTHORITY NEW YORK/NEW JERSEY	NEWARK, NJ.
PROCTOR & GAMBLE	CINCINNATI, OH.
PUBLIX SUPERMARKETS, INC	LAKELAND, FL.
PURDUE FARMS	ROCKINGHAM, NC.
SEARS	OVERLAND PARK, KS.
SHELL CHEMICAL	HOUSTON, TX.
SIEMENS BUILDING TECHNOLOGIES	WINTER PARK, FL.
TEXAS INSTRUMENTS	DALLAS, TX.
THE STELLAR GROUP	JACKSONVILLE, FL.
TIME WARNER CABLE	EL PASO, TX.
TYSON FOODS	SPRINGDALE , AR.
U.S. STATE DEPARTMENT	SPRINGFIELD, VA.
VERIZON	NEW YORK, NY.
WALT DISNEY WORLD CO.	LAKE BUENA VISTA, FL.
WEIS FOODS	STORESIN, PA. AND MD
WESCO DISTRIBUTION	SIOUX CITY, IA.
YALE UNIVERSITY	NEW HAVEN, CT.

# APPROVAL LETTER

Carlisle Syntec Incorporated  
P.O. Box 7000  
Carlisle, PA 17013

August 9, 2006

Portable Pipe Hangers, Inc.  
5534 Harvey Wilson Drive  
Houston, TX 77020

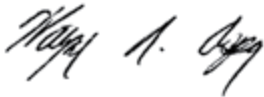
RE: PHP Systems & Design Pipe Supports

Gentlemen:

Please accept this letter as confirmation that the PHP Systems & Design Pipe Supports are acceptable for use with Carlisle's single-ply roofing systems. Proper protection of the single-ply membrane must be provided using either a slip-sheet of extra membrane or a section of walkway pad below the pipe support in accordance with our standard Sleeper Detail for the respective membrane type (EPDM, TPO, or PVC).

If our office can be of any other assistance, please feel free to call.

Sincerely,



Wayne R. Asper  
Supervisor, Systems Design

# APPROVAL LETTER

**Johns Manville Corporation**

10100 W. Ute Ave (80127)

P.O. Box 625001

Littleton, CO 80162-5001

303 978 2367

303 978 2808 Fax

nunnsj@jm.com

August 18, 2006

PHP Systems & Design

5534 Harvey Wilson Dr.

Houston, TX 77020

Attn: Mike Talbot

E-mail: [mike@portablepipehangers.com](mailto:mike@portablepipehangers.com)

Re: Product approval

To Whom It May Concern:

Please be advised that PHP Systems & Design products are acceptable to be installed over our Modified, BUR and Single Ply roofing system provided precautions are taken to protect the roofing system, i.e. the use of Johns Manville walk pads under the base of PHP products.

If you should have any further questions, please do not hesitate to contact the undersigned.

Sincerely,



James Nunns

Technical Services Specialist

Johns Manville Roofing Systems

Southwest Region

800 654 0071

# TERMS AND CONDITIONS

## 1. Acceptance.

No order shall be binding upon us until accepted in writing by an authorized official at our Home Office. Any contract for sale of goods, and these Terms and Conditions of Sale, shall be governed by and constructed in accordance with the Uniform Commercial Code as adopted in the State of Texas.

## 2. Freight.

All prices are F.O.B. our dock or point of shipment, or as otherwise stated. Air Freight shipments will be made upon request, and will be sent F.O.B. shipping point, FREIGHT COLLECT ONLY.

## 3. Catalog Weight, Dimensions and Design Loads.

Catalog weights and dimensions are careful estimates but not guaranteed. Load designs are based on tests as submitted or by calculations of static load applications. In most cases, the load is stated with an applicable factor of safety.

## 4. Errors.

Should an error be made filing an order, notify us promptly and we will immediately attempt to adjust the matter without expense to purchaser.

## 5. Cancellations.

Cancellation of orders will be accepted only with the understanding that we will be reimbursed for expenses incurred as a result of the cancellation. Order for special or non-cataloged items are not subject to cancellation after production has started under any circumstances.

## 6. Returned Material.

Permission to return any standard merchandise must be obtained in writing from our home office in Houston, Texas. Return of merchandise must be made within 90 days from the date of shipment and subject to the following conditions: A) Return transportation must be prepaid; B) Material not in first class, salable condition will be subject to the cost of reconditioning; C) Merchandise credit will be allowed on the basis of the price charged for the merchandise, less a minimum handling charge of 25% for merchandise in standard packages, 30% for merchandise in less than standard packages, and less any outbound freight allowed or paid by us. Returns will only be considered for standard catalog items, and in normal quantities as determined by the Company. Any special or non-cataloged items are not subject to return for credit under any circumstances.

## 7. Delivery.

The estimated shipping date is based on production time required to process the order commencing with the date the order is received by us. If it is necessary to revise the design, specification or conditions of sale, the shipping date shall be automatically extended by the period of time required to actually achieve mutually agreed upon corrections or adjustments of the design, specification or conditions of sale.

## 8. Damage or Loss in Transit.

Delivery of goods to a carrier at our plant or other shipping point shall constitute delivery to purchaser regardless of freight payment. All risk of loss or damage in transit shall pass to purchaser at that time. Purchaser shall make claims for loss or damage to goods in transit against the carrier. We will assist purchaser in securing satisfactory adjustment of such claims, however; if material is delivered short, damaged or missing pieces due to carrier mishandling,

receiver must make a note on the delivery receipt in order to receive replacement material.

## 9. Warranties.

We guarantee to repair or replace at our option any products we find in our sole discretion to be structurally defective in material or workmanship for a period of five (5) years from date of delivery to purchaser. Such warranty specifically excludes repair of non-structural rust damage to products. Our obligation with respect to material found by us to be defective shall be limited to replacement or repair and in no event shall we be liable for transportation to or from our factory, installation, adjustments or any expenses or damages arising in connection with such material. PHP Systems & Design i.e. Portable Pipe Hangers accepts no liability for products not designed and laid out by PHP or for any alteration or modification to the system not authorized by PHP. No warranty expressed or implied shall cover defects caused by outside contractors/ installers of the PHP System.

## 10. Limitations of Liabilities.

- a) Except as specifically provided in this agreement, we make no warranties, express or implied, and specifically disclaim any warranty of merchantability or fitness for a particular purpose. Purchaser's right to recover damages for any reason whatsoever shall be limited to the total of amounts paid by purchaser for purchase of product hereunder.
- b) Neither we nor our affiliated parties shall be liable for any indirect, incidental or consequential damages, foreseen or unforeseen, including lost profits, sustained in connection with the use of products provided under this agreement, regardless of the form of action, whether in contract or in tort, including negligence, strict liability or otherwise.
- c) Any action against us must be brought within 30 days after the cause of action accrues. We shall not be liable for any delay, loss, damage or product failure attributable to any equipment or actions of any person other than ourselves, our employees and agents.

## 11. Claims.

Claims for defective material, shortages, delays, failures in shipment or delivery for any other cause shall be deemed waived and released by purchaser unless made IN WRITING WITHIN 30 DAYS AFTER ARRIVAL OF MATERIAL. If material is delivered short, damaged or missing pieces due to carrier mishandling, receiver must make note on the delivery receipt in order to receive replacement material. Under no circumstances shall purchaser install damaged or defective material if claims are to be made.

## 12. Liability for Misuse.

We shall not be liable for damages to property or persons due to improper installation of our material or through attempts to utilize the material under conditions which exceed the designed capabilities. Purchaser agrees to indemnify and hold us harmless from any and all claims, liabilities, damages, costs and expenses asserted against us or incurred by us because of injuries to persons or damages to property resulting from the improper installation or misuse of the material.