

August 26, 2016

**ADDENDUM NO. 1
to the
Iowa Department of Transportation
Proposal No. 17311
For
Hydraulic Cylinders
Letting Date: September 14, 2016**

Notice To Bidders:

This Addendum is issued to incorporate the following additions, deletions, corrections, and/or clarifications to the terms or specifications and shall hereby be considered a part of the final contract documents. This Addendum shall supersede, modify and/or change all statements to the contrary in the bid proposal and shall take precedence over previous terms or specifications.

ADDITIONAL:

- Attached are the specifications for the cylinders on this proposal.

All Bidders must sign and return this Addendum for the bid opportunity referenced above. Failure to do so may subject the Bidder to disqualification. If a bid response has already been submitted, this Addendum shall be signed and emailed or faxed to the Purchasing Section prior to the scheduled Letting Date.

Company Name *(please print)*

Date

Signature

Sincerely,

Jean Gustafson, Purchasing Agent
Phone No. 515-239-1173 Fax No. 515-239-1538
jean.gustafson@dot.iowa.gov

IOWA DEPARTMENT OF TRANSPORTATION
EQUIPMENT SERVICES
SPECIFICATIONS
for
HYDRAULIC CYLINDERS & RAMS

The following specifications and dimensions shall apply to the purchase of hydraulic cylinders and rams for the Iowa Department of Transportation, statewide warehouse. Cylinders will primarily be used on snow removal trucks and equipment. These cylinders will be subject to severe shock loads from snow plowing and ice scraping operations. Successful vendor should be well versed in supplying components to this industry. All components must be designed for a 3,000-PSI system working pressure.

To be considered by the Department, proposed units shall meet the following minimum specifications. All items to be bid differently than requested in the specifications will require the review and approval of Equipment Services before they will be accepted. See "Supplemental Terms and Conditions" under "Alternatives or Exceptions" in the bid proposal for more details. Please include all literature and technical data needed to support such a request.

Components used in the manufacturing of these cylinders and rams shall meet the following minimum requirements:

1. Steel Tubing, ASTM A513, Type-5
 - A. (DOM) welded and drawn over mandrel, stress relief annealed.
 - B. Grade (UNS G10260) 1026; Class DOM-SRA
 - C. Inside diameter shall be honed to a micro finish of 10-20 RMS.
 - D. Tubing bore shall be smooth throughout; end shall be internally chamfered to allow easy non-damaging insertion of the piston seal and gland.

2. Piston Rod Shafting, ASTM A311-B
 - A. Rod shall be solid cold drawn bar, heavy draft stress relieved.
 - B. All rods shall be solid with the exception of the 3-inch and 4-inch snow plow lift displacement rams. These rams shall meet the requirements of sections 1, A and B. Three (3) inch tube shall have a 3/16-inch wall thickness; four (4) inch tube shall have a 1/4-inch (minimum) wall thickness.
 - C. Grade C1045/1050 rod with minimum yield strength of 100,000-PSI and 8% elongation for steel shafting between 1 and 2-inches; 75,000-PSI for 2-1/4 inch and larger shaft.
 - D. Shafting shall be ground and polished and then chrome plated with a minimum chrome thickness of 0.001-inch per side at a Rockwell Hardness (Rc) of 68 to 72. Chrome shall polish to a micro finish of 16 RMS.

- E. Shafting tolerances, OD: 1-Inch to 1-1/2 Inches - +0.000 to - 0.001-Inches
2-Inch Rod - +0.000 to 0.0015-Inches
2-1/2 Inch Rod - +0.000 to -0.002-Inches
3-Inch to 4-Inch Tubing - +0.000 to 0.003-Inches
- F. Chrome shaft shall be certified as rust resistant, passing the ASTM B117 36-hour salt spray test with no visible rusting.
- G. Shaft shall be turned down to no less than 1-inch diameter for piston attachment. Piston shall be attached to the rod with a minimum 1-inch, self-locking nut or approved equal design.
- H. Upon request, vendor shall immediately make available to the Department all mill, plating and salt spray test certification sheets. Failure to supply documentation upon request will result in the immediate cancellation of all contracts and purchase orders.

3. Rod End-Cap/Gland

- A. Aluminum or brass end cap (glands) on the rod end of the cylinder. End cap shall thread onto or into the tube. Threads shall be liberally coated with anti-seize when assembled.
- B. All cylinders will require positive locks for gland nuts and gland nut rod packing (lock wire or retaining rings types will not be acceptable). If set screws are used, a minimum size of 5/16-inch will be required.

4. Seals

- A. Piston Seal: Unless otherwise stated, piston seals shall be Standard PolyPak with O-ring style spring backer, moly coated (Parker Standard molythane gray PolyPak) or 2-ring capped t-seal design (Verco Capped T-Seal). O-ring, Uni-ring, and/or M-seal configurations are not acceptable.
- B. Piston Rod Seal: Unless otherwise stated, piston rod seal shall be Standard PolyPak with O-ring style spring backer, moly coated (Parker standard molythane gray PolyPak) or symmetrical loaded U-cup w/B-lip (Verco). O-ring, Uni-ring and /or M-seal configurations are not acceptable.
- C. Gland Seal: O-ring with backer. O-rings to be a minimum of 70 durometer hardness Nitrile compound.
- D. Rod Wiper: Snap-in, one piece (Parker type D or approved equal) installed in the rod end cap.
- E. Specialty requirements may require other seals. Those requirements will be called out as needed.

5. Ports

- A. Ports shall be as listed below unless specifically stated otherwise in the cylinder "Item" section.
- B. All ports shall be welded onto the cylinder body. Straight thread o-ring boss (ORB) ports shall have a maximum height of 9/16-inch above the cylinder wall. These will

be identified by their dash size. Tapered thread (NPT) pope ports shall be standard height half couplers, called out by their inch size.

- C. Single acting cylinders shall have a -6 ORB "A" (extend) port and a 3/8-inch NPT "B" (vent) port. The "B" port shall have a 90° elbow with compressed brass wire breather for venting rod side of piston. Elbow shall be aimed at the "A" port.
- D. Double acting cylinders shall have -6 ORB ports for both "A" and "B" ports.

6. Cylinder Attaching Points and Drawing Explanations

- A. Cylinders and rams, unless otherwise specifically stated, will attach with 1-inch, solid steel pins. Pin holes in the attaching points shall be 1-1/32 inch diameter unless stated otherwise. All attaching point dimensions shall have a tolerance of $\pm 1/64$ -inch.
- B. Drawing-1 – Basic cylinder with reference letters that correspond to the following cylinder requirements.
- C. Drawing-2 – Rod shall be bored to accept an attaching pin. Hole shall be slightly chamfered to remove sharp edges.
- D. Drawing-3 – Cap end attaching point shall be constructed from a solid piece of steel with a 1-1/4 inch radius from the pin centerline.
- E. Drawing-4 – Rod-end eyelet shall be 1/2-inch wall, mechanical tubing. End of piston rod shall be chamfered back 3/16-inch at a 45° angle for better weld penetration. Tubing shall be welded, 100% all around to the rod end. If weld protrudes above the flat sides of the tubing, it shall be ground or machined off flush.
- F. Drawing-5 – Cap end eyelet shall be mechanical tubing securely welded along both sides to the end cap with multiple weld passes.
- G. Drawing-6 – Rod end shall be milled flat on opposite sides, back a minimum of 3/4-inch. Pin attaching point shall be flat steel plates, welded to the milled areas. Dimension between end of rod and centerline of pin hole shall be 1-1/2 inches.
- H. Drawing-7 – Pin attaching point shall be flat steel plate (s) welded to the end cap.
- I. Drawing-8 – Trunnion mounting point is a cast and machined end cap housing welded to the cylinder barrel. Gland is machined to be flush in trunnion rod end.
- J. Drawing-9 – Trunnion attaching ring shall be a solid piece of mechanical tubing pressed onto the outside of the cylinder barrel and fully welded all around on both ends. Before installation, both sides of the trunnion mount shall be pressed into appropriately sized holes, in this ring and fully welded all around the outside AND plug welded from the inside.

7. Cylinder Painting

- A. All ports shall be plugged with the exception of the vent ports on single acting cylinders. Vent ports shall be covered with a plastic cap.
- B. Cylinders shall be completely cleaned and primed with a rust inhibitive primer sealer.
- C. Primed cylinder shall be completely painted with Omaha Orange paint (International Harvester #0311).

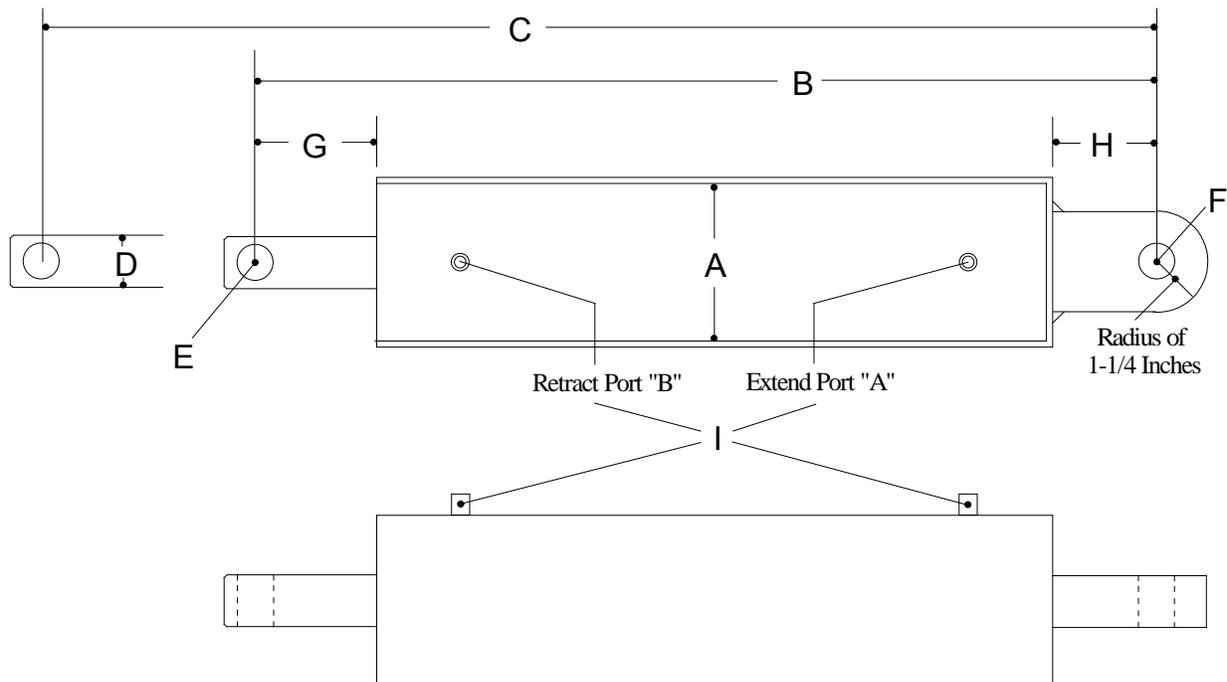
8. Cylinder Dimensions

The following letters and descriptions (A thru I) corresponds to the indicated item on the Page-4 and 6, drawings 1, 8 and 9. They also correspond to the description of each stock number item to be purchased.

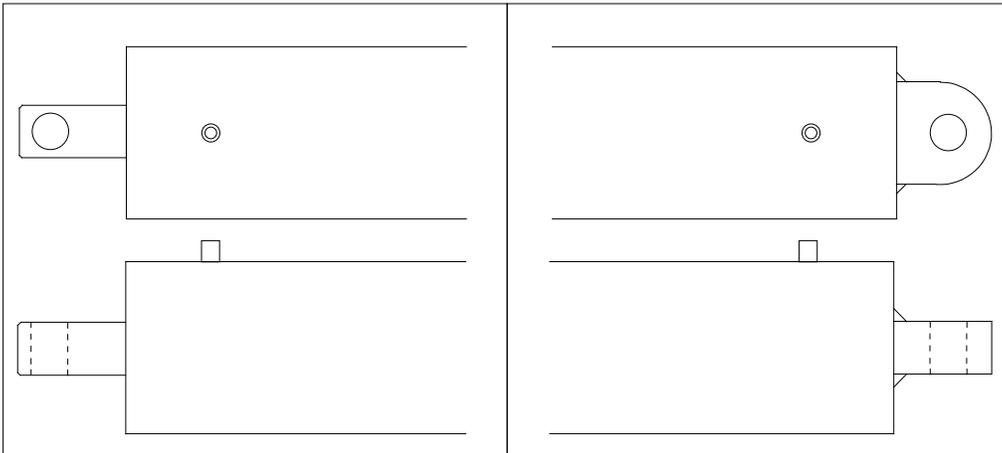
- A. Inside diameter bore.
- B. Retracted length on pin centerlines.
- C. Extended length on pin centerlines.
- D. Piston rod diameter.
- E. Pin attaching point on rod end.
- F. Pin attaching point on cap end.
- G. Clearance between pin centerline and rod end, end cap.
- H. Clearance between pin centerline and cap end, end cap.
- I. Location of "A" and "B" ports in relation to the attaching points.

Drawings 2 through 9 also detail the attaching points and port locations.

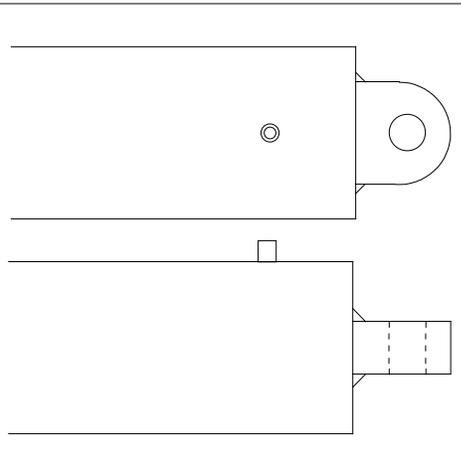
Drawing-1



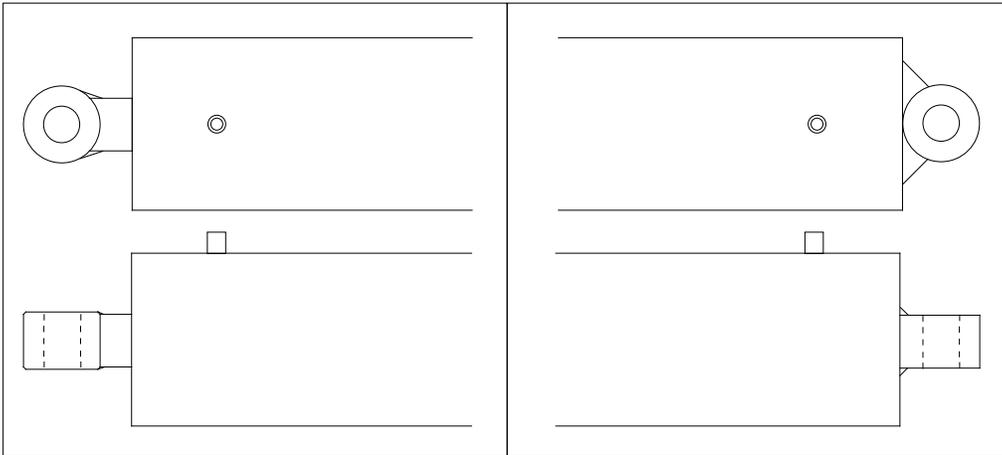
Drawing-2



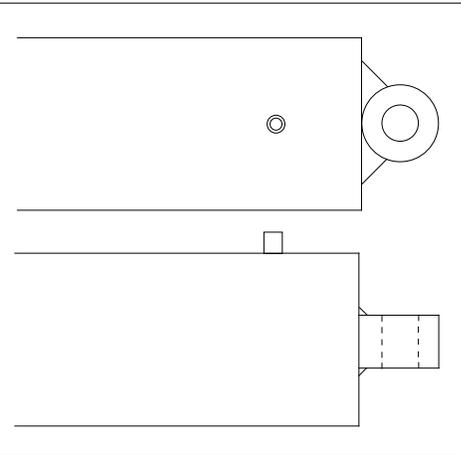
Drawing-3



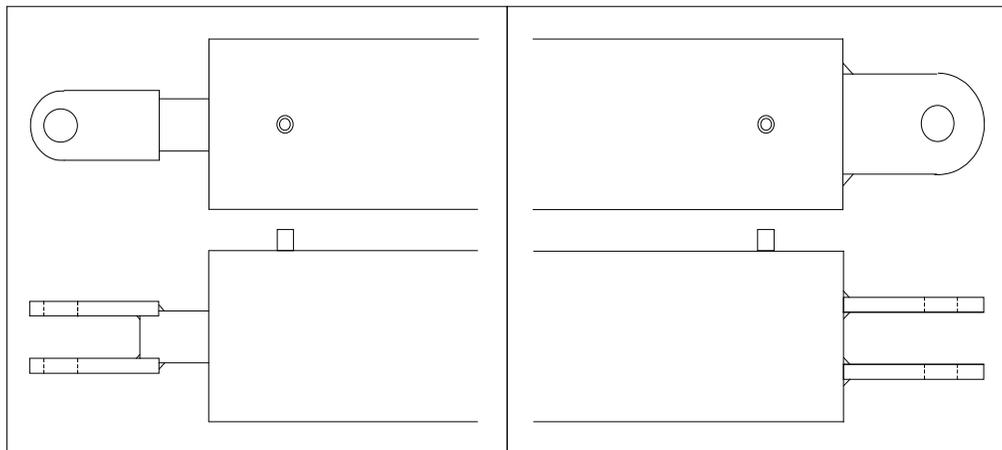
Drawing-4



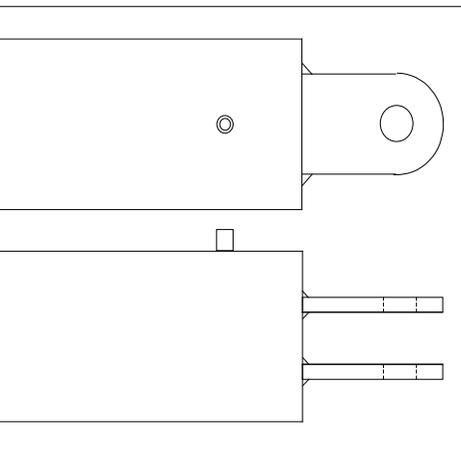
Drawing-5



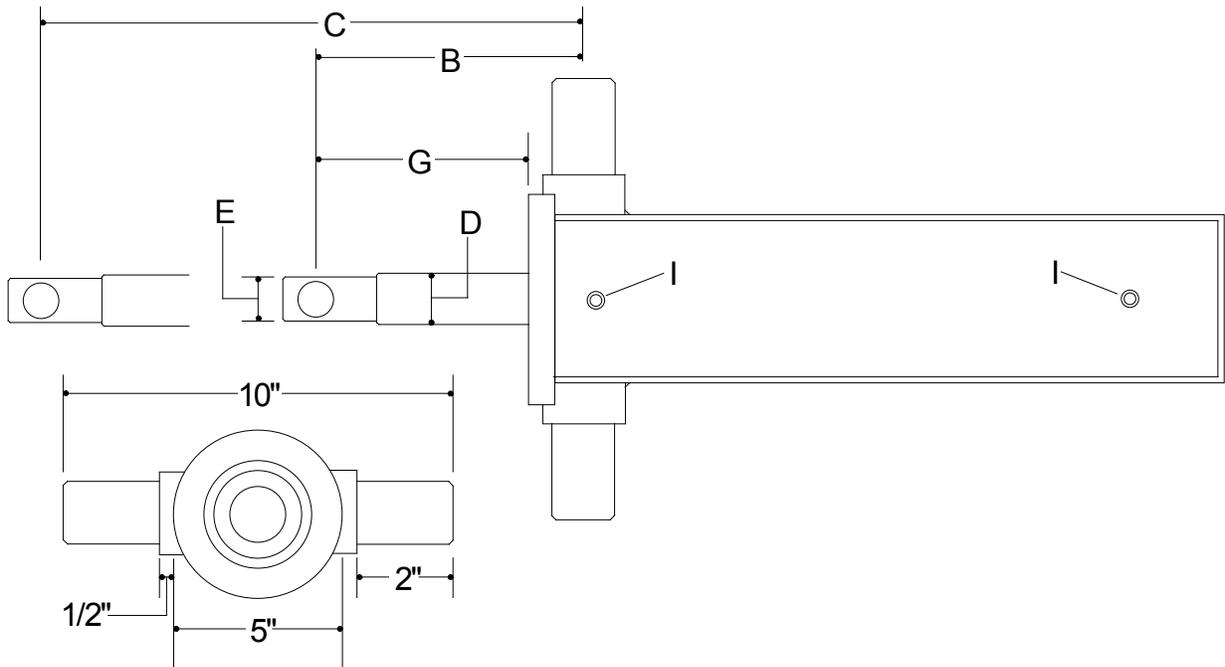
Drawing-6



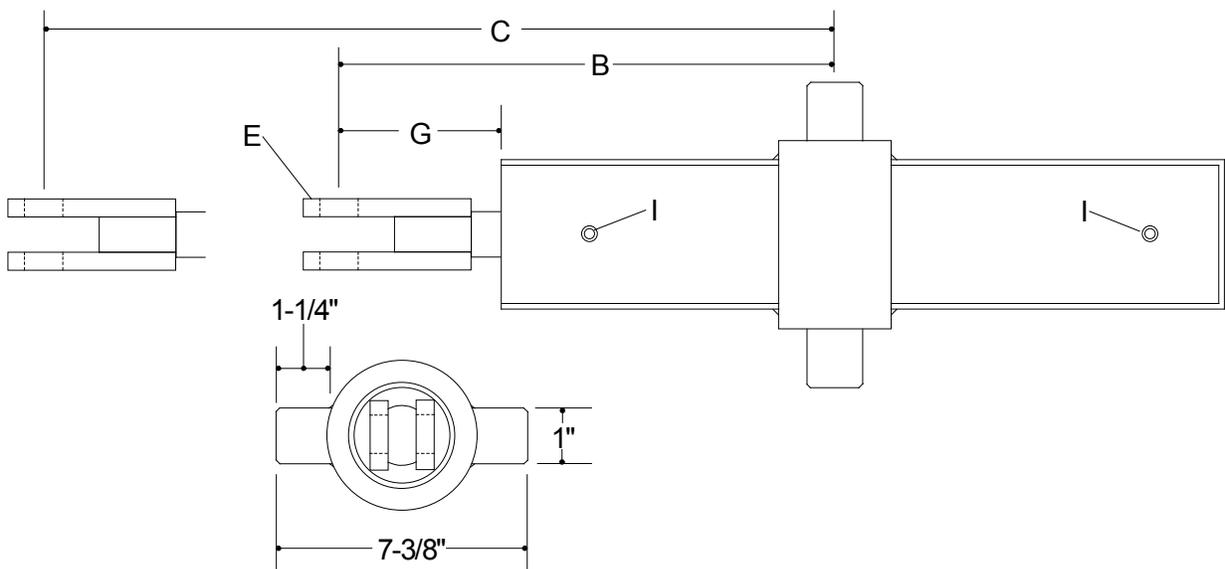
Drawing-7



Drawing-8



Drawing-9



GROUP-1 – SINGLE AND DOUBLE ACTING CYLINDERS

ITEM-1.1 – DOT Stk. #252-011555 – Wing Lift: Single Acting, 5-Inch Stroke

- A. Bore: 3-inches.
- B. Retracted: 14-inches.
- C. Extended: 19-inches.
- D. Piston Rod Diameter: 1-1/2 inches.
- E. Rod End Pin Attachment (Drawing-4): 1/2-inch wall, mechanical tubing, 2-inches long.
- F. Cap End Pin Attachment (Drawing-5): 1/2-inch wall, mechanical tubing, 7-inches long.
- G. Pin Centerline to Rod End, End Cap Clearance: 2-1/4 inches.
- H. Pin Centerline to Cap End Clearance: 1-inch.
- I. Ports: “A” and “B” In-Line with Attaching Pin at Cap End: “B” port with 90-degree elbow and air vent aimed at the “A” port.

ITEM-1.2 – DOT Stk. #934-042650 – Plow Reverse: Double Acting, 10-Inch Stroke

- A. Bore: 3-inches.
- B. Retracted: 18-1/2 inches.
- C. Extended: 28-1/2 inches.
- D. Piston Rode Diameter: 1-1/2 inches.
- E. Rod End Pin Attachment (Drawing-4): 1/2-inch wall mechanical tubing, 1-1/2 inches long.
- F. Cap End Pin Attachment (Drawing-3): solid steel block, 1-1/2 inches thick x 2-1/2 inches tall x 2-1/4 inches long, rounded to 1-1/4 inches radius from pin centerline.
- G. Pin Centerline to Rod End, End Cap: 1-1/2 inches.
- H. Pin Centerline to Cap End, End Cap: 1-inch.
- I. Ports: “A” and “B” ports at 90-degrees from cap end pin.

ITEM-1.3 – DOT Stk. #252-014007 – Wing Slide: Double Acting, 27-Inch Stroke.

- A. Bore: 3-inches.
- B. Retracted: 36-1/4 inches.
- C. Extended: 63-1/4 inches.
- D. Piston Rod Diameter: 1-1/2 inches.
- E. Rod End Pin Attachment (Drawing-4): 1/2-inch wall mechanical tubing, 2-inches long.
- F. Cap End Pin Attachment (Drawing-3): solid steel block, 1-1/2 inches thick x 2-1/2 inches tall x 2-3/4 inches long rounded to 1-1/4 inches radius from centerline.
- G. Pin Centerline to Rod End, End Cap Clearance: 1-1/2 inches.
- H. Pin Centerline to Cap End, End Cap Clearance: 1-1/2 inches.
- I. Ports: “A” and “B” in-line with attachment pin at cap end. Ports must not extend more than 1/2-inch above the outside diameter of the cylinder barrel.

GROUP-2 – SINGLE ACTING DISPLACEMENT RAMS

ITEM-2.1 – DOT Stk. #003-401430 Plow Lift – 3-Inch Bore, 10-Inch Stroke

- A. Bore: 3-inches, 3-1/2 inch barrel outside diameter.
- B. Retracted: 19-inches.
- C. Extended: 29-inches.
- D. Piston Rod Diameter: 3-inch, tubular rod capped on both ends.
- E. Rod End Pin Attachment (Drawing-3): Solid steel, 3-inch round rod end cap welded to tubular rod. Milled to 1-1/2 inch thickness back 2-3/8 inches.
- F. Cap End Pin Attachment (Drawing-3): Solid steel, 3-1/2 inch round barrel end cap welded to the barrel tube. Milled to 1-1/2 inch thickness, 2-1/8 inches back.
- G. Pin centerline to end of 1-1/2 inch thickness milling on rod-end: 1-1/2 inches.
- H. Pin centerline to end of 1-1/2 inch milling thickness on butt-end: 1-1/4 inches.
- I. Ports: SPECIAL – Two (2) ports shall be machined into the cap end, end cap. One (1) shall be 3/8-inch, NPT, directly across from this NPT port shall be a -8 ORB port. Both ports shall be plugged with a pressure rated; steel plug allowing the user to select whichever port type is desired. Both ports shall be in-line with the cap end pin.
- J. Gland Nut and Packing: SPECIAL – Gland packing in this displacement ram shall be a fabric, reinforced “V” stack, neoprene, chevron style with a minimum height of 1-inch and a minimum 0.3125 cross section. Packing shall be protected by a heavy duty backup ring. Packing shall be adjustable by a solid brass gland nut, threaded into the steel barrel.
- K. Rated Burst Pressure: Minimum of 6,000 PSI.

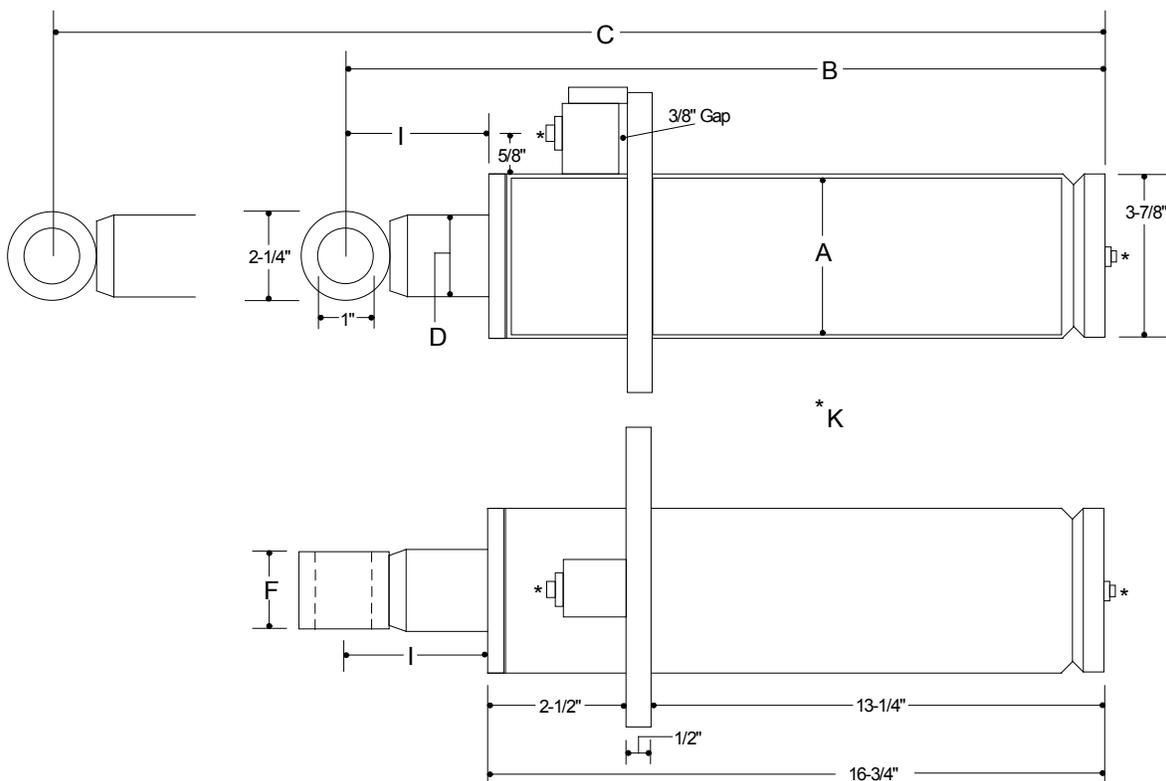
GROUP-3 – ROOT BRAND REPLACEMENT CYLINDERS

ITEM-3.1 – DOT Stk. # 003-402185 – Curl Cylinder f/Root I66 Underbody Snow Plow: Double Acting, 4-Inch Stroke, Root 06185.

- A. Bore: 3-inches.
- B. Retracted: 4.38-inches.
- C. Extended: 8.38-inches.
- D. Piston Rod Diameter: 1-1/2 inches only.
- E. Rod End Pin Attachment (Drawing-4): 1/2-inch wall, mechanical tubing, 1-3/4 inches long.
- F. Cap End Pin Attachment (Drawing-8): Root trunnion mount system with 1-1/2 inch trunnion pins.
- G. Pin centerline to rod-end end cap clearance: 1-1/4 inches.
- H. Trunnion centerline to rod-end pin centerline: 4.38-inches.
- I. Ports: A and B at 90-degrees to trunnion pins.
- J. Seals: Root standard seals are acceptable. If aftermarket seals are used, Department seal specifications must be followed.

GROUP-4 – MONROE BRAND REPLACEMENT CYLINDERSITEM-4.1 – DOT Stk. # 003-500080 (Monroe number 05002821) – 3.5 x 10 Curl Cylinder (Drawing-10)

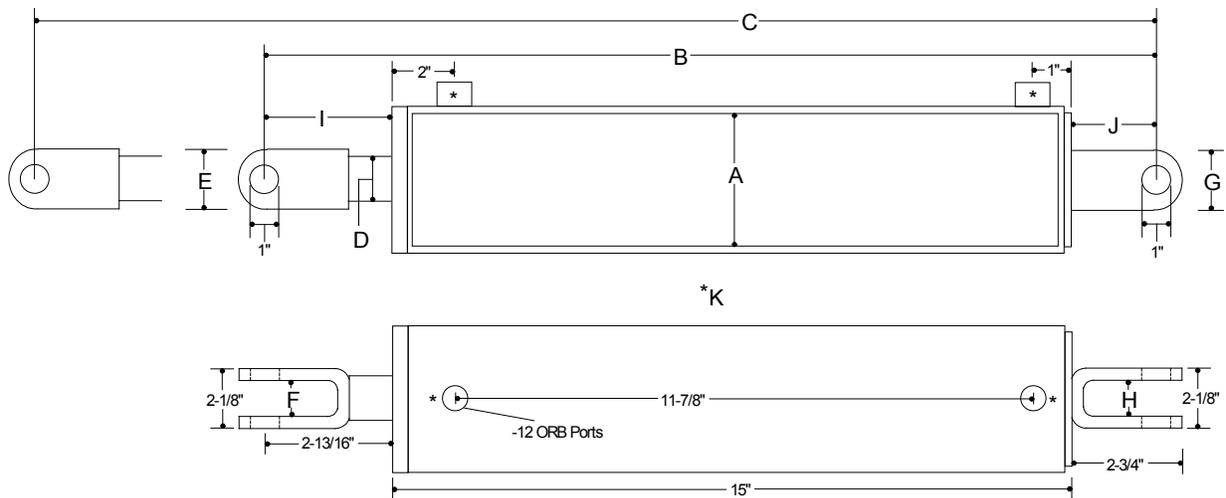
- A. Bore: 3-Inches
- B. Retracted: 19-1/4 Inches
- C. Extended: 29-1/4 Inches
- D. Piston Rod Diameter: 2-Inches
- E. Rod End, Pin Attachment Height: 2-1/4 Inches
- F. Rod End, Pin Attachment Width: 1-3/4 Inches
- G. Cap End, Pin Attachment Height: N/A
- H. Cap End, Pin Attachment Width: N/A
- I. Rod End, Pin Centerline: 2-5/16 Inches
- J. Cap End, Pin Centerline: N/A
- K. Ports: 3/8-Inch NPT

Drawing-10

ITEM-4.2 – DOT Stk. # 003-500200 (Monroe number 05002502) – Rear Mount Wing Raise Cylinder (Drawing-11)

- A. Bore: 3-Inches
- B. Retracted: 19-1/2 Inches
- C. Extended: 29-1/2 Inches
- D. Piston Rod Diameter: 1-1/2 Inches
- E. Rod End, Pin Attachment Height: 2-Inches
- F. Rod End, Pin Attachment Width: 1-1/8 Inches
- G. Cap End, Pin Attachment Height: 2-Inches
- H. Cap End, Pin Attachment Width: 1-1/8 Inches
- I. Rod End, Pin Centerline: 2-7/8 Inches
- J. Cap End, Pin Centerline: 1-3/4 Inches
- K. Ports: -12 ORP

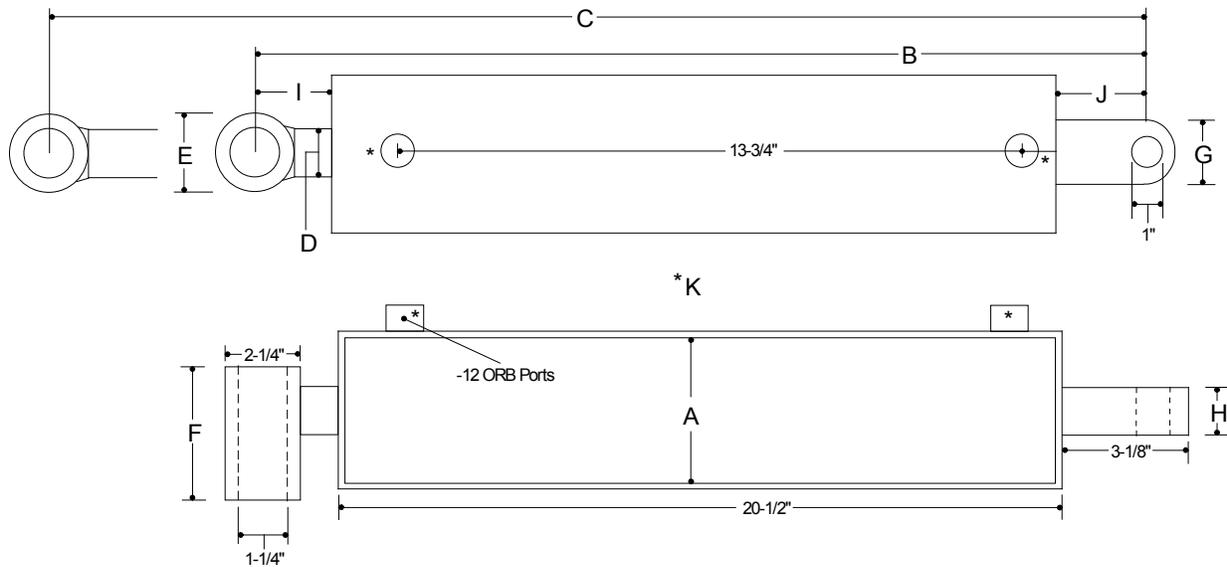
Drawing-11



ITEM-4.3 – DOT Stk. # 003-500100 (Monroe number 05002501) – Rear Mount Wing Slide Cylinder (Drawing-12)

- A. Bore: 4-Inches
- B. Retracted: 20-3/4 Inches
- C. Extended: 32-5/8 Inches
- D. Piston Rod Diameter: 2-Inches
- E. Rod End, Pin Attachment Height: 2-1/4 Inches
- F. Rod End, Pin Attachment Width: 4-3/8 Inches
- G. Cap End, Pin Attachment Height: 2-1/4 Inches
- H. Cap End, Pin Attachment Width: 1-3/8 Inches
- I. Rod End, Pin Centerline: 1-5/8 Inches
- J. Cap End, Pin Centerline: 2-Inches
- K. Ports: -12 ORP

Drawing-12



ITEM-4.4 – DOT Stk. # 003-500068 (Monroe number 05002791) – Ice Blade Lift Cylinder
(Drawing-13)

- A. Bore: 4-Inches
- B. Retracted: 18-7/8 Inches
- C. Extended: 22-3/4 Inches
- D. Piston Rod Diameter: 2-Inches
- E. Rod End, Pin Attachment Height: 3-Inches
- F. Rod End, Pin Attachment Width: 1-7/8 Inches
- G. Cap End, Pin Attachment Height: 2-1/4 Inches
- H. Cap End, Pin Attachment Width: 5-1/2 Inches
- I. Rod End, Pin Centerline: 4-11/16 Inches
- J. Cap End, Pin Centerline: 1-1/8 Inches
- K. Ports: -12 ORB

Drawing-13

