

# PAKSITAN STANDARD SPECIFICATIONS FOR FRAME TYPE CHISEL PLOUGH

## 1 SCOPE

- 1.1 This standard specifies the material, dimensions, manufacturing and other requirements of major/critical components/sub-assemblies and replacement parts of tractor rear mounted frame type chisel plough to ensure proper quality control measures in the manufacture of these implements.
- 1.2 This standard is related to trade and manufacturing practices prevailing in the country and therefore, permits the purchaser to use his option for selecting the implement to suit his requirements.

## 2 NORMATIVE REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of PS ---/2018. At the time of publication, the edition indicated was valid. All the normative references listed below are subject to revision, and parties to agreement, based on this part of PS ---/2018 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below;

- i) ISO 530-1:1994(E): Agricultural tractors – Rear-mounted three-point linkage – Part 1: Categories 1, 2, 3 and 4.
- ii) PS 1650/1/1984: Specification for Agricultural Wheeled Tractors – Three point linkage – Part 1: categories 1, 2 and 3.
- iii) PS 1808/86: Agricultural wheeled tractors – Three-point linkage – Linchpins.
- iv) PS 877/72: The provision of safety on farm implements.
- v) ASAE S318.9/SAE J208d: Safety for Agricultural equipment.

## 3 DEFINITIONS

For the purpose of this Pakistan Standard, the following definitions shall apply.

- 3.1 **Chisel plow:** is tractor rear mounted implement which is used for deep tillage to break hardpan and stir up the soil without inverting the same. Use of chisel plow facilitates root development and conservation of rain water. It may have 3, 5, 7 or even more number of tines. Depth of penetration may vary according to tractor power and soil compaction.
- 3.2 **Linkage Categories:** Linkage categories have been standardized through PS 1650/I/1984 and ISO 530-1:1994(E) as per tractor drawbar power which helps in selecting matching size of implements with tractor drawbar power. Recommended size of implement to be used with specified tractor drawbar power and associated category of three point linkage system of the tractor is shown below;

Linkage Category	Tractor drawbar power		Recommended size of implement
	kW	HP	
1	15-35	20-45	5 and 7tine chisel plow
2	30-75	40-100	7 and 9 tine chisel plow
3	60-168	80-225	9 and 11 tine chisel plow

- 3.3 **Three point linkage assembly:** Combination of one upper link and two lower links, each articulated to the tractor and the implement at the opposite ends in order to connect the implement to the tractor.
- 3.4 **Three-point hitch assembly:** Combination of implement mast (providing yoke with hole for insertion of upper hitch attachment) and two lower hitch attachments on the implement, each used to connect tractor links with the implement rigidly.
- 3.5 **Upper hitch attachment:** Pin, usually detachable and forming part of the upper link assembly, by which an upper link is secured.
- 3.6 **Lower hitch attachment:** Pin, or clevis and pin, usually attached to the implement, by which a lower link is secured.
- 3.7 **Hitch point:** Articulated connection between link and implement.
- 3.8 **Mast:** Component of the implement that provides location of the upper hitch point on the implements.
- 3.9 **Linchpin:** Pin, usually fitted with a spring retaining device, by which an articulated connection is retained in position.
- 3.10 **Lower hitch attachment span:** Distance between the shoulders of the lower hitch pins or inner faces of the clevis prongs against which the sides of the lower link socket ball joints abut.
- 3.11 **Mast height:** Vertical distance between the center line of the upper hitch point and the
- 3.12 **Clevis:** a U-shaped piece with two prongs having holes for clevis pin which may be welded or clamped to the implement frame. The socket ball of lower link is inserted in the clevis prongs and the connection is secured through clevis pin and linchpin.
- 3.13 **Mounted Implement:** An implement which is directly attached with the tractor by connecting three point linkages and three point hitch. During transportation, implement is lifted by the three point linkage with the help of tractor hydraulic system.
- 3.14 **Mild Steel (MS):** Steel with low carbon contents in the range of 0.05%-0.25% carbon. It is commonly used for implement frame, mast and other non-wearing and structural components of the implements.
- 3.15 **Medium Carbon Steel (MCS):** Steel with medium carbon contents in the range of 0.29-0.54 percent. It is commonly used for soil working and wearing components of the implements.
- 3.16 **Frame:** Rigid structure to which different components of the implement are attached.
- 3.17 **Tine:** A rigid formed member, hinged to the frame of chisel plough to which soil working tools like shovel is attached.
- 3.18 **Contact Angle:** The forward angle between the horizontal ground and the tangent line joining the shovel tip, when shovel is fitted with tine and placed on its working position.

- 3.19 **Shovel:** A curved reversible soil working tool with both ends pointed, which is attached to the lower end of the tine and is used primarily for land preparation.
- 3.20 **Working width:** The working width of the chisel plough shall be determined by multiplying the number of tines and spacing between two consecutive tines fitted at specified spacing, expressed in “m”.

#### 4 DIMENSIONAL, MATERIAL AND MANUFACTURING REQUIREMENTS

*Note: All dimensions are in mm and minimum, except where tolerances are specified.*

##### 4.1 Frame and three-point hitch assembly (Figure 1)

Frame and three-point hitch assembly of a typical frame type 05 tine chisel plow is shown in Figure 1(a).

##### 4.1.1 Frame Assembly

- 4.1.1.1 Frame assembly shall consist of main frame, frame reinforcement member, mast mounting brackets and mast support mounting brackets.
- 4.1.1.2 Main frame shall be made of MS box section measuring 130 mm x 130 mm x 06 mm. It shall be of rectangular shape having width 1850 mm and length to accommodate required number of tines
- 4.1.1.3 Frame reinforcement member shall be made from MS box measuring 130 x 65 x 6 mm.
- 4.1.1.4 Mast mounting brackets shall be made from MS plate measuring 75 x 13 mm which shall be welded to frame reinforcement members.
- 4.1.1.5 Mast shall be bolted to the mast mounting brackets using M18 bolts.
- 4.1.1.6 Mast support brackets shall be made from MS plate 9 mm thick and shall be welded to rear member of main frame

##### 4.1.2 Three-point hitch assembly

Three point hitch assembly shall conform to provisions of PS 1650/1/1984 and ISO 530-1:1994(E) and shall consist of a mast yoke to connect upper hitch point and two lower hitch attachments to connect lower hitch points with the implement.

##### **Mast and mast support**

- 4.1.2.1 Mast shall preferably be made from formed MS plate 9 mm thick.
- 4.1.2.2 Width between inner faces of yoke ( $W_1$ ), width between outer faces of yoke ( $W_2$ ) and diameter of hitch pin hole ( $D_1$ ) shall have dimensions as specified in Table 1.
- 4.1.2.3 Mast support shall be made from MS Box measuring 50 x 50 x 4 mm

##### **Lower hitch attachments**

- 4.1.2.4 Lower hitch attachment may be clevis and pin type.
- 4.1.2.5 Clevis prongs shall be made from MS plates 13 mm thick which shall be welded directly to the front member of the main frame.

4.1.2.6 The width between inner faces of clevis prongs ( $W_3$ ) and diameter of clevis pin holes ( $D_2$ ) shall have dimensions as specified in Table 1.

4.1.2.7 The clevis prongs shall be welded to front member of the main frame at a place to ensure that mast height ( $H_1$ ) and lower hitch attachments span(S) shall be as specified in Table 1.

*Note: Vital dimensions of three-point hitch assembly are shown in Table 1 and Figure 1(b).*

**4.1.3 Upper hitch attachment, clevis pin and linchpin (Figure 2)**

4.1.3.1 Upper hitch attachment, clevis pin and linchpin shall be made from cold drawn MS which shall be zinc coated to make these corrosion resistant.

4.1.3.2 Upper hitch attachment and clevis pin for different categories of three point linkages shall have dimensions as specified in Table 2.

4.1.4 Linchpin for different categories of three point linkage systems shall conform to provisions of PS 1808/86 and shall have dimensions as specified in Table 3.

**Table 1: Vital dimensions of the three-point hitch assembly**

Dimension	Cat1		Cat2		Cat3	
	Min.	Max.	Min.	Max.	Min.	Max.
<b>Mast</b>						
Width between inner faces of yoke ( $W_1$ )	44.5	-	52.0	-	52.0	-
Width between outer faces of yoke ( $W_2$ )	-	69	-	86	-	95
Diameter of yoke hole ( $D_1$ )	19.30	19.32	25.70	25.72	32.00	32.25
Mast height (H)	460 ± 1.5		610 ± 1.5		685 ± 1.5	
<b>Lower hitch attachments</b>						
Width between inner faces of clevis prongs ( $W_3$ )	-	65	-	65	-	65
Diameter of clevis prongs hole ( $D_2$ )	22.40	22.73	28.70	29.03	37.40	37.75
Span of lower hitch attachments (S)	683 ± 1.5		825 ± 1.5		965 ± 1.5	

**Table 2 (a): Upper hitch attachment dimensions**

Dimension	Cat 1	Cat 2	Cat 3
Diameter of upper hitch attachment (B)	18.97 - 19.00	25.27 - 25.40	31.50 - 31.75
Linchpin hole distance (A)	76 min	93 min	102 min
Diameter of linchpin hole (C)	12	12	12

**Table 2 (b): Clevis pin dimensions**

Dimension	Cat 1	Cat 2	Cat 3
Diameter of clevis pin (B)	21.79 - 20.00	27.79 - 28.00	36.40 - 36.50
Linchpin hole distance (A)	110*	110*	110*
Diameter of linchpin hole (C)	12	12	17

\* To be adjusted according to the thickness of clevis prongs by keeping dimension  $W_3$  as specified in Table 1 above.

**Table 3: Linchpin dimensions**

<b>Dimension</b>	<b>Cat 1</b>	<b>Cat 2</b>	<b>Cat 3</b>
Linchpin length (A)	32	32	32
Diameter of Linchpin (B)	11	11	16
Diameter of spring/retaining wire (C)	3	3	3

**4.2 Tine Assembly (Figure 3)**

- 4.2.1 Tine assembly shall consist of tine, tine mounting bracket and shovel.
- 4.2.2 Tine may be formed as curved parabolic made from forgedsteel and shall have dimensions as shown in Figure 3 (a).
- 4.2.3 Tine mounting bracket shall be made from 02 Nos. MS angle 75 x 75 x 9 mm and 01 No. MS plate 210 x 180 x 12 mm which shall be clamped to frame using 04 Nos. M18 bolts.
- 4.2.4 Tine shall be bolted with lower angles of the tine mounting bracket using M18 bolts.
- 4.2.5 Shovel shall be made from forged MCS and shall have dimensions as shown in Figure 3 (c).
- 4.2.6 Shovel shall be welded directly to the tine in a manner to ensure that the **contact angle is (155)degrees as shown in Figure 3 (d).**
- 4.2.7 Shovel shall have hardness of **HRC 45-50.**

**4.3 Working width**

4.3.1 The working width of the chisel plough with different number of tines shall be as below which shall be produced and declared by the manufacturers;

Sr. No.	Number of tines	Working width with 380 mm tine spacing (m)
i)	05	1.900
ii)	07	2.66
iii)	09	3.420
iv)	11	4.880

**5 OTHER REQUIREMENTS**

- 5.1 All the structural components shall be manufactured by using new materials.
- 5.2 All the market items like tines, shovels, pipes, nuts and bolts shall be brand new.
- 5.3 Nuts and bolts shall be zinc coated.
- 5.3.1.1 Spacing between two consecutive tine brackets shall be adjustable and standard setting shall be provided for  $380 \pm 5$  mm.
- 5.4 Overall size and weight of the chisel plough shall be declared by the manufacturer.
- 5.5 The frame shall be rigid and strong.

- 5.6 All the components/sub-assemblies shall be welded at right angle and parallel members of the frame shall be of equal length and size.
- 5.7 Provision for adjustability of tine spacing shall be provided, if required.
- 5.8 All the nut bolt fastenings shall be tightened at appropriate torque using imported spring washers.
- 5.9 Operation and maintenance (O&M) manual shall be provided in English & Urdu with complete illustrations of assembling of replaceable components.
- 5.10 O&M manual shall also contain relevant safety instructions as provided in PS 877:1972 and ASAE S318.9/SAE J208d.
- 5.11 A set of pins with linchpins and two adjustable wrenches of 250 mm and 300 mm size should also be provided.
- 5.12 The implement shall be painted preferably using baking/stoving paint with primer.

## **6 FINISH AND WORKMANSHIP**

- 6.1 All components of the chisel plough should be free from pits, burrs and other visual defects.
- 6.2 The welding of various parts shall be satisfactory in all respects.
- 6.3 All the weld-ments shall be smoothed by grinding.
- 6.4 All the exposed parts shall have protective coating to prevent surface from rusting and to avoid deterioration in transit and during storage.

## **7 MARKING AND PACKING**

- 7.1 Each chisel plough shall be marked with the following particular:
  - 7.1.1 Manufacturer's name, address, contact numbers and trade-mark, if any;
  - 7.1.2 Maximum size and number of tines; and
  - 7.1.3 Batch or code number.
- 7.2 The particulars listed under 7.1.1, 7.1.2 and 7.1.3 shall be stamped embossed or engraved on metallic plate and rigidly fitted on a non-wearing part of the chisel plough.
- 7.3 Each chisel plough may also carry the PSQCA Certification Mark subject to verification by the competent authority.
- 7.4 The chisel plough should be packed to ensure safety of the components in transportation as agreed to between the purchaser and the manufacturer/supplier.

*Note: Design of a typical 05 tine frame type chisel plough is shown in Figure4. The design can be modified as agreed between the purchaser and the manufacturer subject to compliance of these standard specifications.*

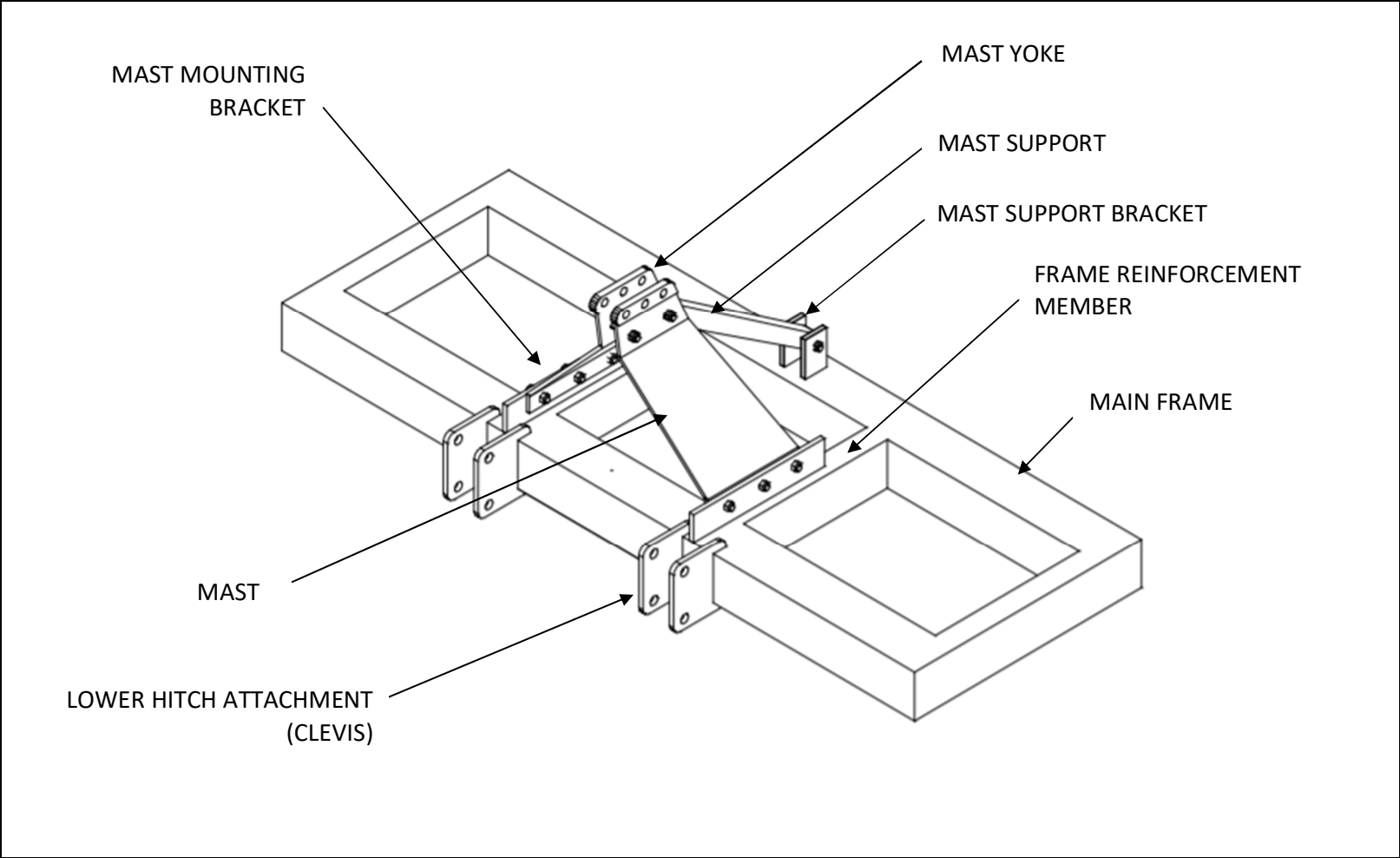


Figure 1(a): Frame and hitch assembly

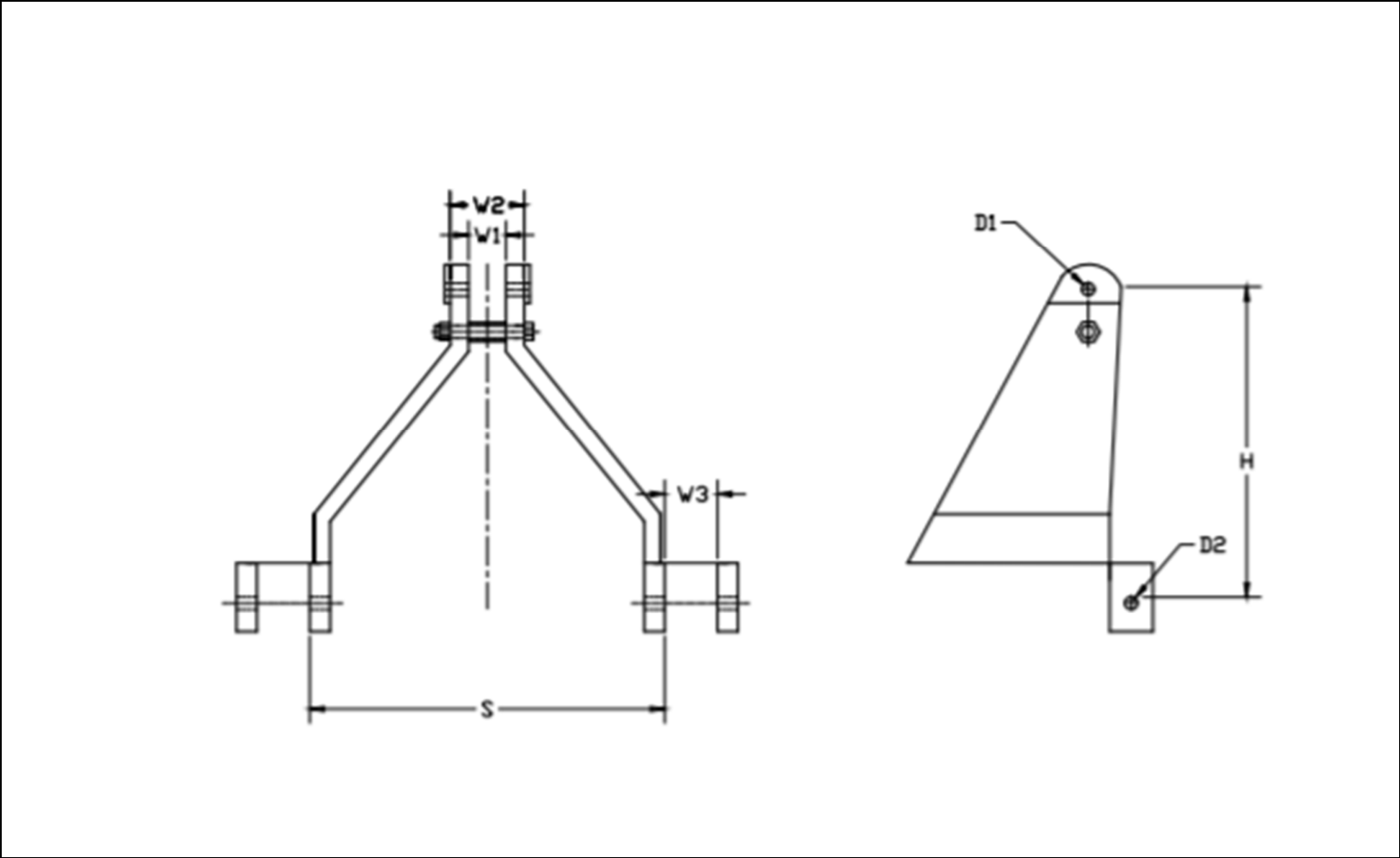


Figure 1 (b): Dimensions of three point hitch



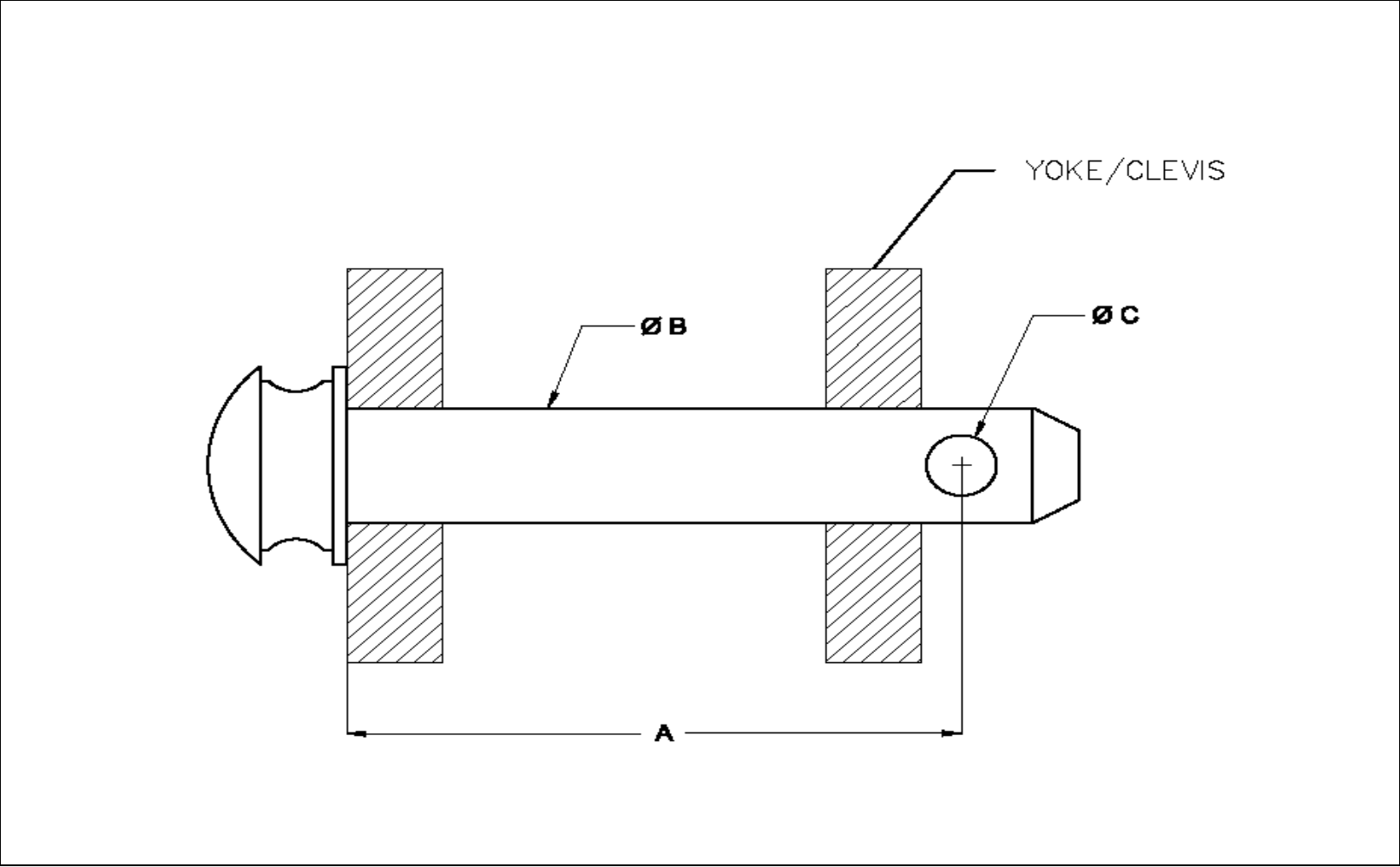


Figure 2(a): Upper hitch attachment and clevis pin dimensions

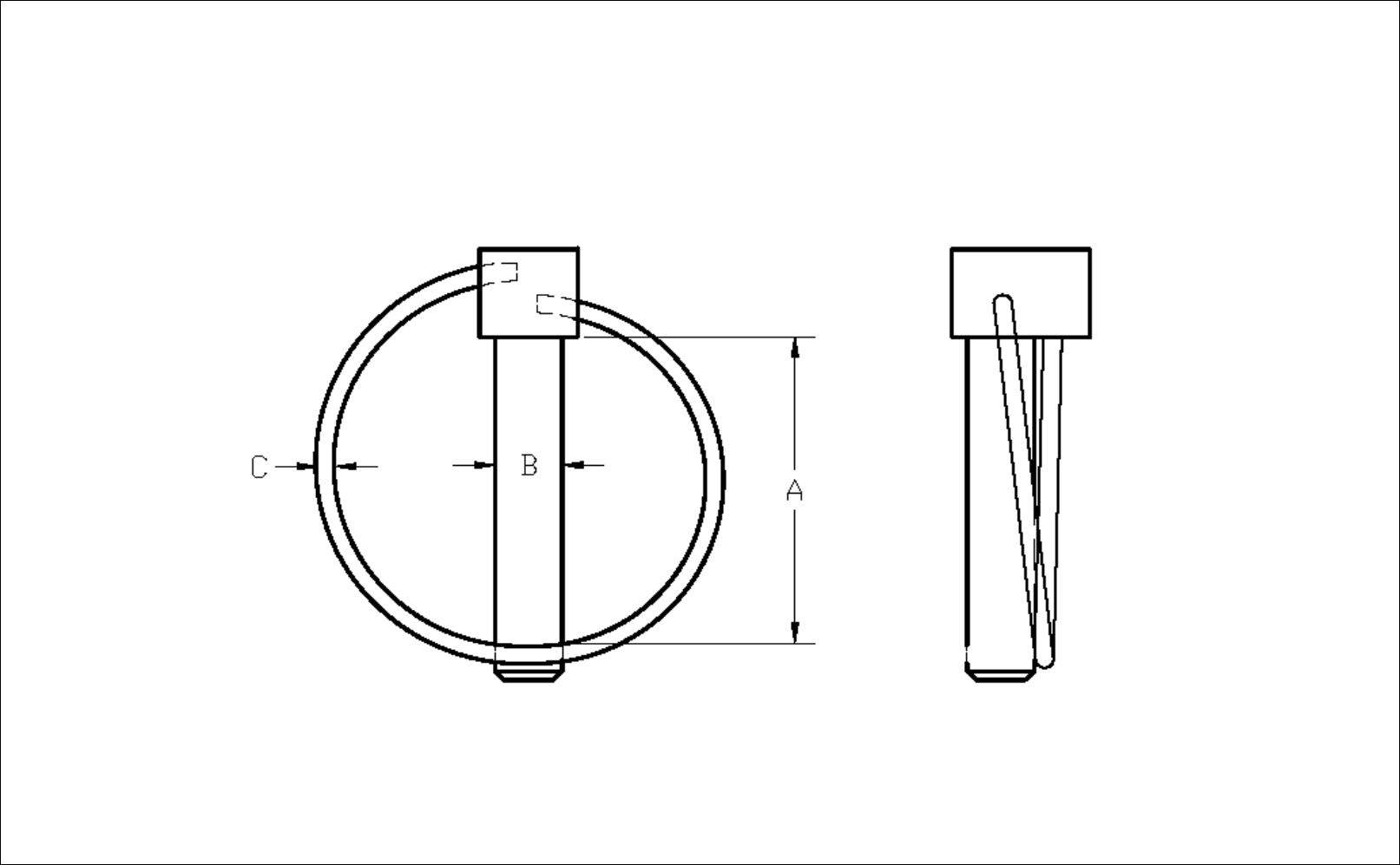


Figure 2(b): Linchpin dimensions

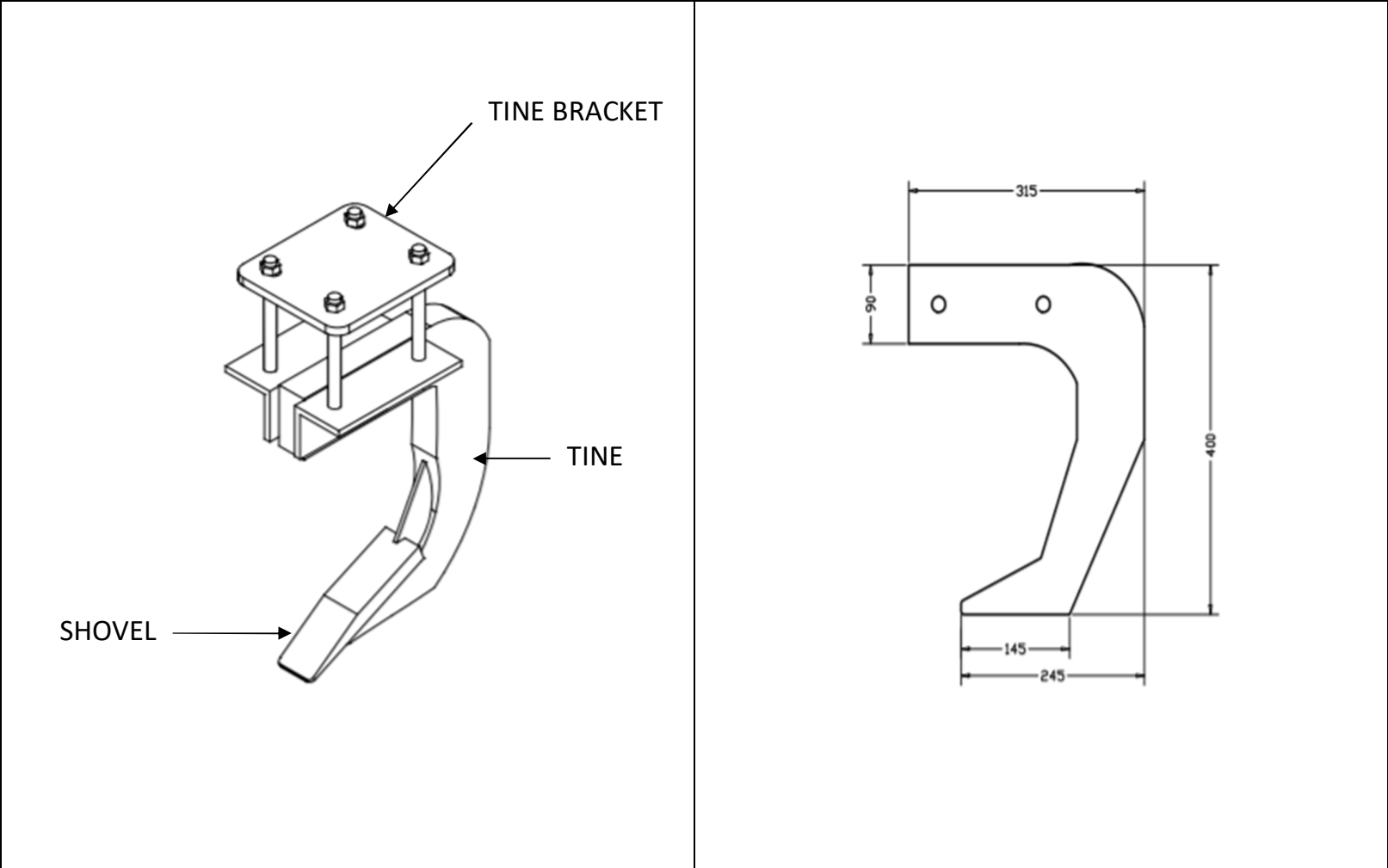


Figure 3 (a): Tine assembly

Figure 3 (b): Tine dimensions

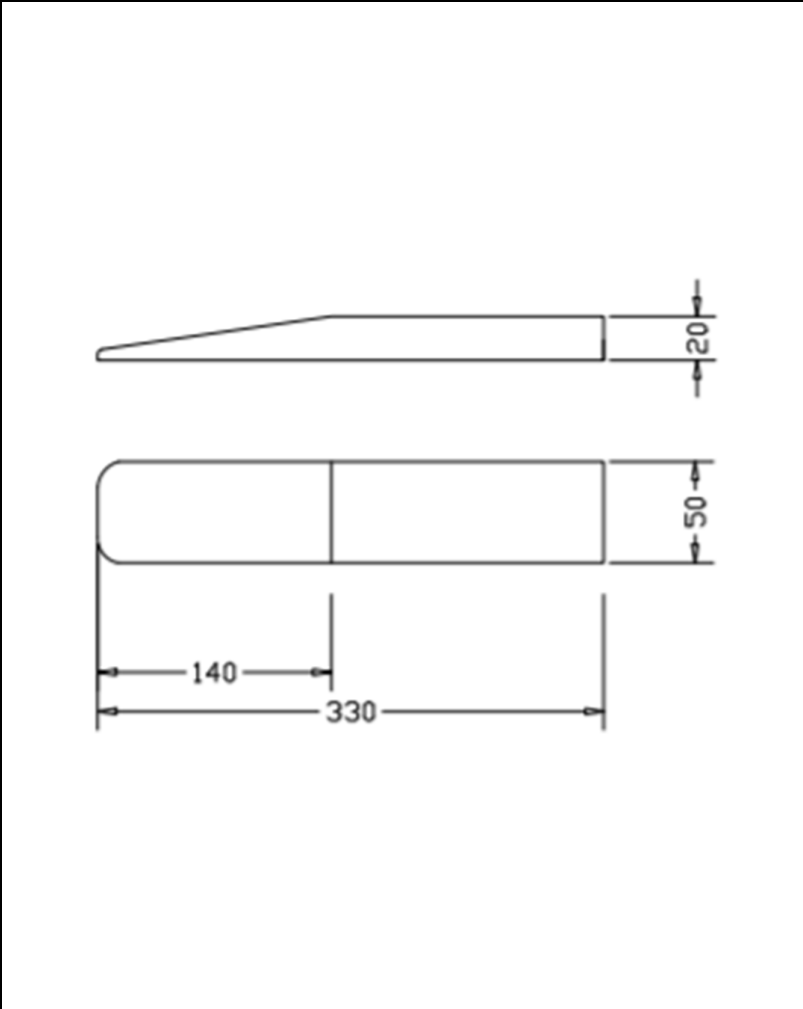


Figure 3(c): Shovel dimensions

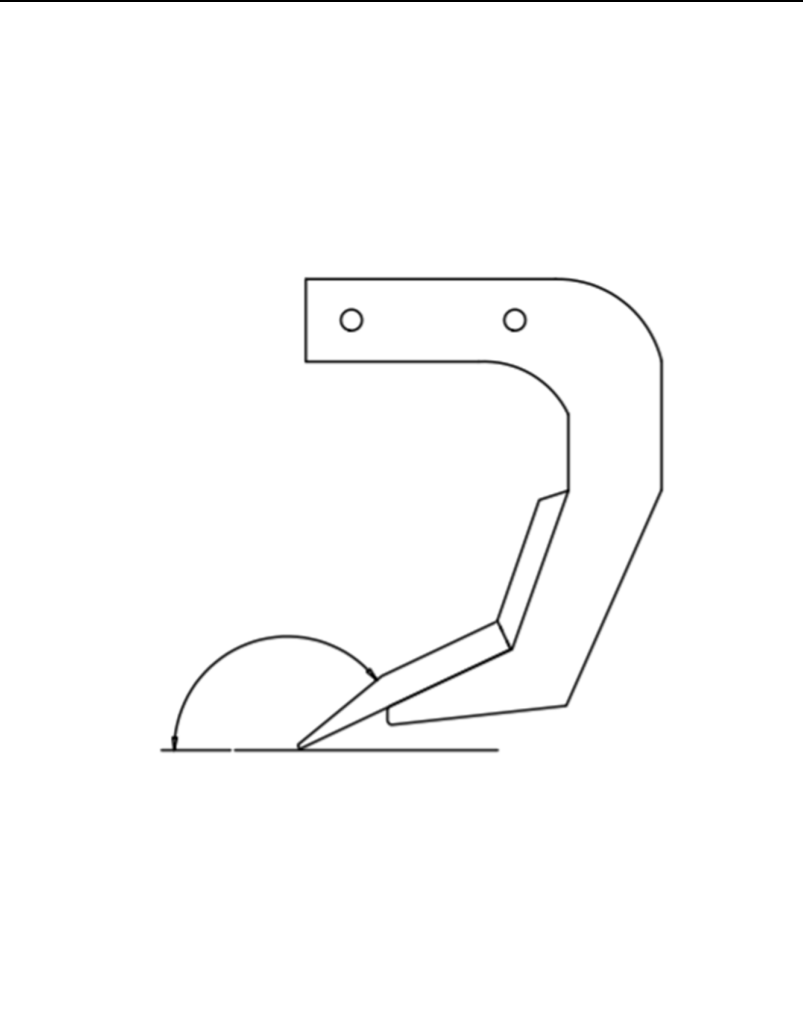


Figure 3 (d): Contact angle of shovel

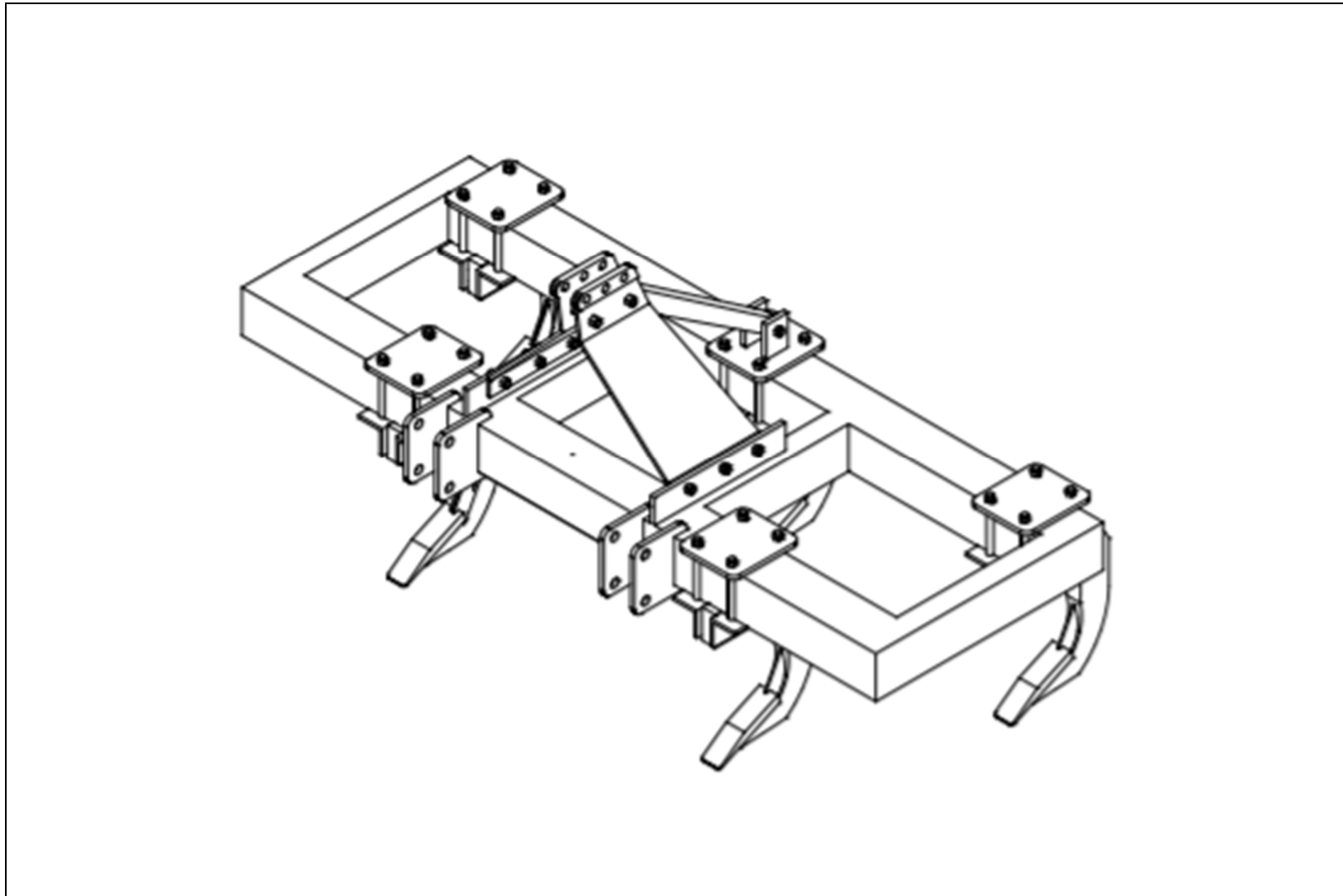


Figure 4: Typical frame type 05 tine chisel plow