

**Riveting – Course: Technique for Manual Working of Materials.  
Instruction Examples for Practical Vocational Training**



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# **Riveting – Course: Technique for Manual Working of Materials. Instruction Examples for Practical Vocational Training**

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## **Introduction**

The present documentation comprises 5 selected instruction examples by means of which countersunk–head riveted joints and button–head, riveted joints in various alternatives can be exercised.

The emphasis is laid on the rigid connection between sheet metals.

All workpieces can be used in the workshop after their completion!

Protective jaws and try squares complete the tool outfit of the trainee at his workplace, waste shovel and waste bin are required for cleaning the workshop, tool cabinets can be locked and secured by means of the key–bolt.

To facilitate the preparation and the execution of the work, the materials, hand tools, measuring and testing tools as well as accessories required for each instruction example are given. Moreover, the previous knowledge is mentioned which is required for the individual exercises. On the basis of the working drawings enclosed and the appertaining sequences of operations the workpieces can be manufactured.

Explanations as to material indication:

Marking of the steel is done with the value of tensile strength in the unit of "Megapascal" (MPa).

## **Instruction example 11.1. Protective jaws**

Exercising of double–sided countersunk–head riveted joints as rigid connection between two metal sheets.

### Material

– 2 x sheet steel (380 MPa)

Thickness: 2 mm

Width: 82 mm

Length: 122 mm

– 2 x aluminium sheet

Thickness: 10 mm

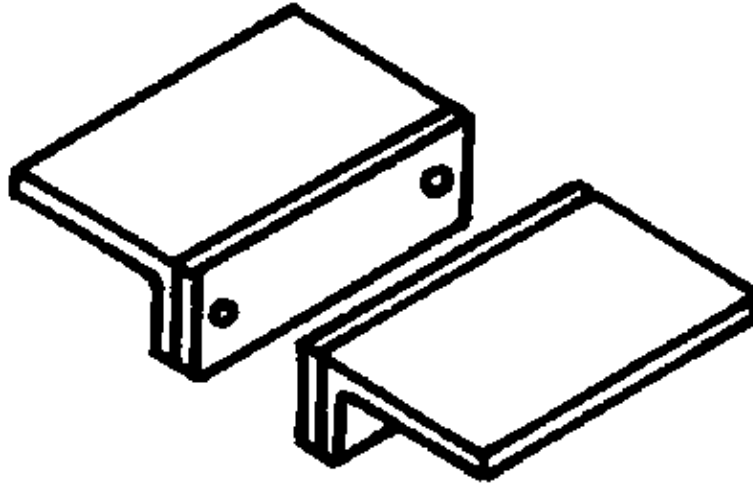
Width: 28 mm

Length: 122 mm

– 4 x aluminium wire (rivet bolts)

Diameter: 4 mm

Length: 16 mm



#### Hand tools

Steel scribe or marking gauge, centre punch, engineers' hammer, aluminium hammer, hand hacksaw, bastard and smooth file 250 mm (flat)

#### Measuring and testing tools

Steel rule, try square, vernier caliper

#### Accessories

Vice, surface plate, surface plate or anvil, lubricant and coolant (soluble oil), clamp dogs or C-clamps, clamping jaws for round material, rivet set for 4 mm rivets

#### Required previous knowledge

Reading of the drawings, measuring, testing, scribing, prick-punching, sawing, filing, drilling, countersinking/counterboring

#### **Sequence of operations**

#### **Comments**

1. Arrange workplace, prepare working material

– Check for completeness

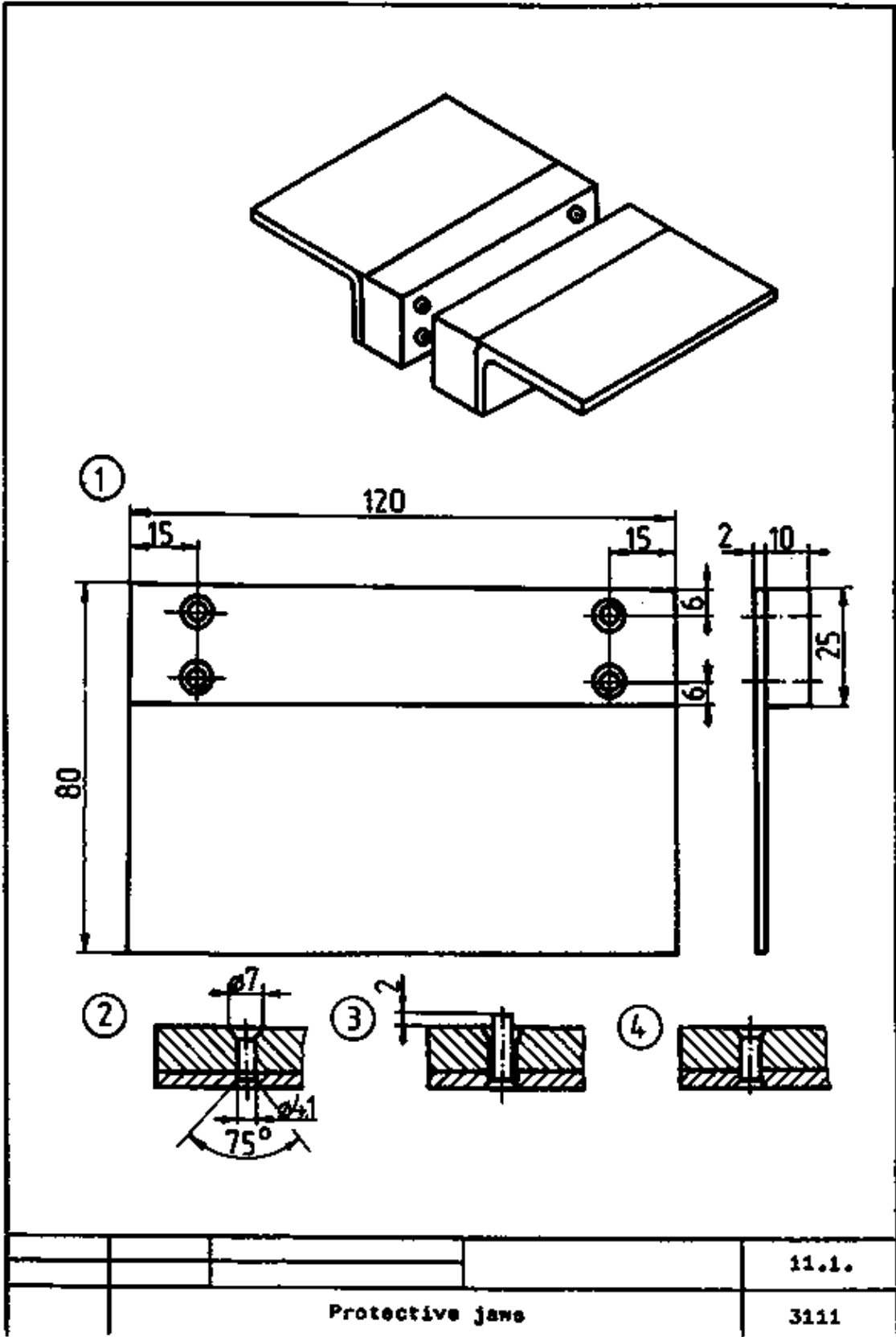
2. Preparing the required sizes of the steel sheets and aluminium sheets according to the drawing

– Sawing (shearing)  
Filing

3. Fixing together of a steel sheet and an aluminium sheet by means of a clamp dog or a C-clamp

– Stage (1) Upper edges and sides to be exactly in alignment!

- |  |   |
|--|---|
| 4. Scribing and punching of the holes; drilling and countersinking   | – Stage(2)<br>Drill and countersink the holes as per drawing!                     |
| 5. Checking of the aluminium wires for their required lengths; fixing them into the vice by clamping jaws for round material             | – Wire to project 2 mm over the clamping jaws!                                    |
| 6. Upsetting of the rivet head with uniform and light hammer blows –forming of the die head  |   |
| 7. Inserting of the upset rivet bolt into the hole of the sheets clamped together, putting of the sheets on the surface plate            | – Stage (3)<br>Upset side of the rivet bolt (die head) lies on the surface plate! |
| 8. Pressing together of the sheets by hammer blows on the rivet set, the die head sets to the sheets                                     | – Rivet bolt sits firmly in the hole!   |
| 9. Heading of the closing head by light hammer blows, subsequently forming so that the countersunk hole is completely filled out         | – Stage (4)   |
| 10. Turning of the sheets and checking of the reverse side of the riveted joint (countersunk hole must be completely filled out as well) | – If necessary, rework the countersunk head                                       |
| 11. Making of the second riveting  | – Same as operations 7 to 10  |
| 12. Riveting of the second steel sheet with the second aluminium sheet   | – Same as operations 3 to 11  |
| 13. Loosening of the clamping tools  |   |
| 14. Checking of the rivets for clean, not projecting countersunk heads as well as for rigid connection of the sheets                     | – If necessary, rework!   |
| 15. Fixing of the parts into the vice and tangent bending of the sheets by the aluminium hammer  |   |
| 16. Final check  | – Accuracy to size, appearance  |



Protective jaws

**Instruction example 11.2. Try square**

Exercising of single-row countersunk-head riveted joints as rigid connection between three metal sheets.

Material



– Steel sheet (of high–strength or hardenable steel)

Thickness: 5 mm

Width: 75 mm

Length: 115 mm (or from instruction example 4.5.)

– 2 x steel sheet (of high–strength or hardenable steel)

Thickness: 3 mm

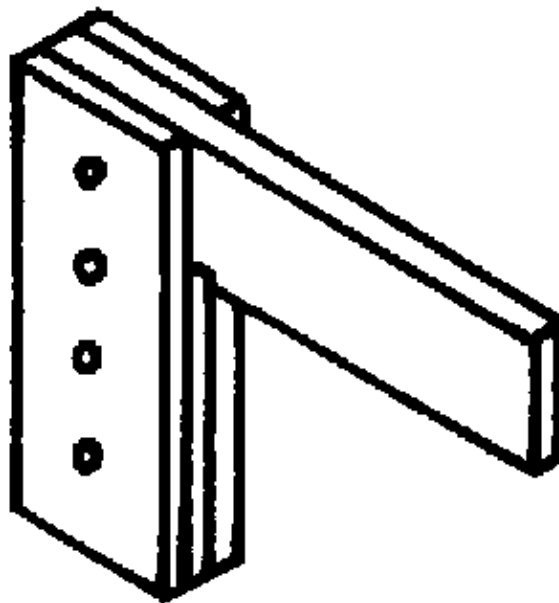
Width: 25 mm

Length: 75 mm

– 4 x countersunk–head rivets (steel)

Diameter: 4 mm

Length: 13 mm



### Hand tools

Steel scribe or marking gauge, centre punch, engineers' hammer, hand hacksaw, bastard and smooth file 250 mm (flat), drill 4.1 or 4.3 mm dia.; countersink 75°

### Measuring and testing tools

Steel rule, try square, bevelled edge square, vernier caliper

### Accessories

Vice, surface plate, surface plate or anvil, lubricant and coolant (soluble oil), clamp dogs or C–clamps, rivet set for 4 mm rivets

### Required previous knowledge

Reading of the drawing, measuring, testing, scribing, prick–punching, sawing, filing, drilling, countersinking/counterboring

### **Sequence of operations**

### **Comments**

- |  |   |
|--|---|
| 1. Arrange workplace, prepare working material   | – Check for completeness  |
| 2. Preparing the sizes of the steel sheets as per drawing  | – Sawing, filing  |
| 3. Clamping together of the steel sheets by means of clamp dog or C-clamp  | – Edges to be exactly in alignment  |
| 4. Scribing and centre-punching of the holes, drilling and countersinking of all holes as per drawing  | – Clamping tools must be reclamped for this operation!  |
| 5. Inserting of the first rivet into the hole, putting of the sheets on the surface plate with the countersunk-head side of the rivet, fastening once more with the rivet set (tighten up) | – Sheets can be fastened after drilling with two screws as well, thus the hole alignment is maintained! |
| 6. Upsetting of the closing head with light hammer blows, subsequently forming so that the countersunk hole is completely filled out   |   |
| 7. Turning of the sheets and checking of the back side (countersunk hole must be completely filled out as well)  |   |
| 8. Making of all the other rivetings as well   | – Same as operations 5 to 7   |
| 9. Loosening of the clamping tools   |   |
| 10. Checking of the rivets for clean, not projecting countersunk heads as well as for rigid connection of the sheets   | – If necessary, rework!   |
| 11. Checking of the edges for exact alignment as well as for angularity  | – If necessary, rework by filing!   |
| 12. Final check  | – Accuracy to size, appearance  |

Completion

Have the inner and outer edges hardened (if hardenable steel is used)



– Sheet steel (380 MPa)

Thickness: 1.5 to 2 mm

Width: 242 mm

Length: 260 mm

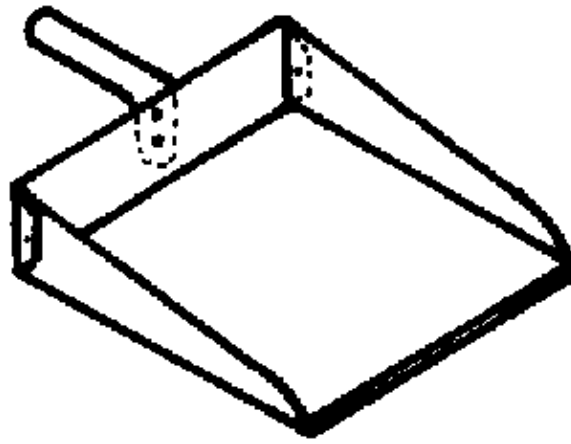
– Steel pipe (380 MPa)

Diameter: 22 mm

Length: 160 mm

– 4 x copper wire (rivet bolt)

Diameter: 4 mm



### Hand tools

Steel scribe, centre punch, engineers' hammer, hand hacksaw, smooth file 250 mm (flat), drill 4.3 mm dia., header for 4 mm rivets, taper reamer

### Accessories

Vice, surface plate, surface plate or anvil, lubricant and coolant (soluble oil), C-clamps, rivet set for 4 mm rivets, holder or riveting support for 4 mm rivets, clamping jaws for round material, tap wrench

### Required previous knowledge

Reading of the drawings, measuring, testing, scribing, prick-punching, sawing, filing, drilling, countersinking/counterboring, hammering

### **Sequence of operations**

### **Comments**

1. Arrange workplace, prepare working material

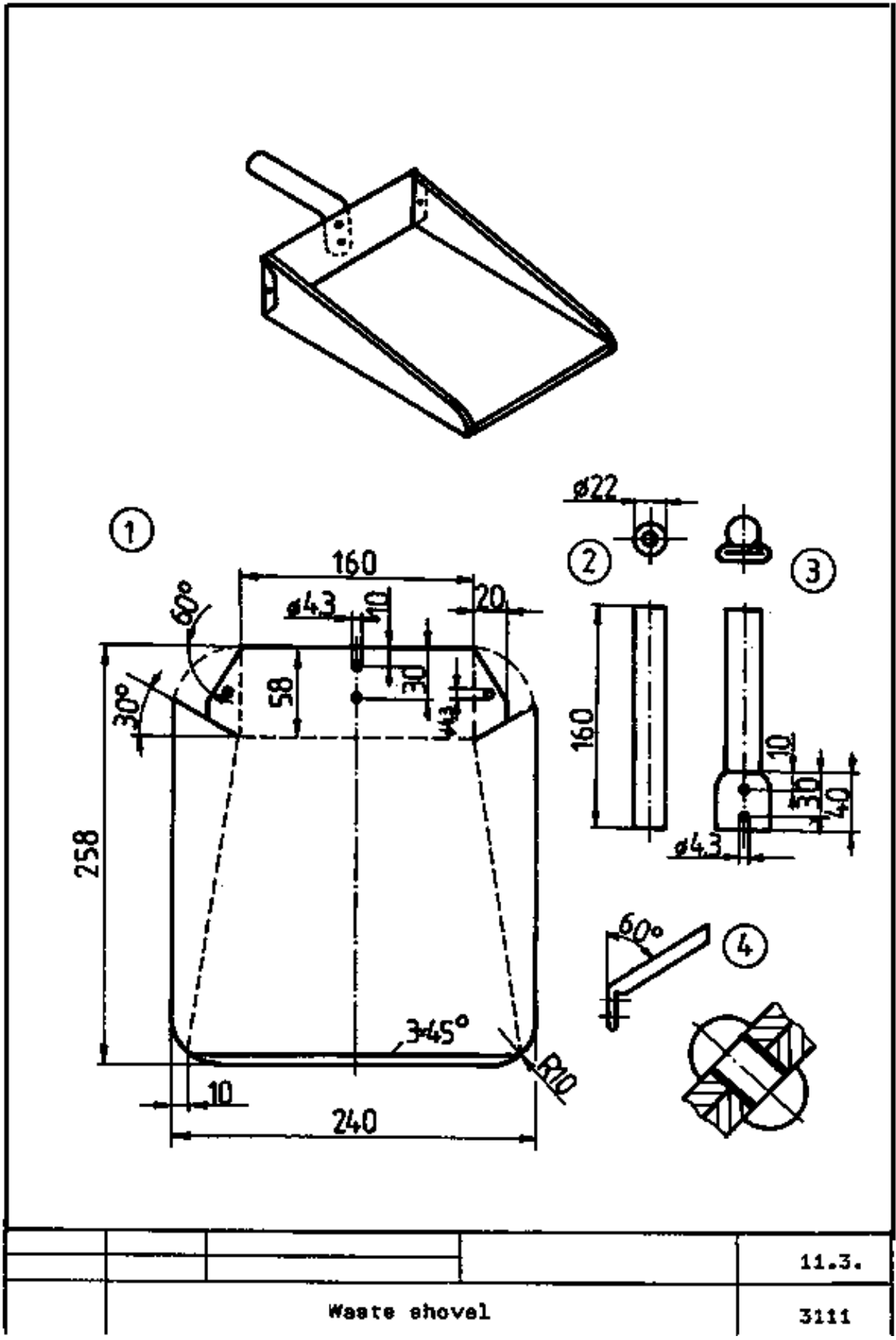
– Check for completeness

2. Preparing the size of the sheet steel according to the drawing, scribing of the holes, centre punching and drilling

– Stage (1)  
Deburr exactly the sheet edges and holes

– Stages (2) (3) (4)

3. Hammering out of the steel pipe from one side to a length of 40 mm, scribing of the holes, punching and drilling, subsequently bending in the vice
4. Fixing of the copper wire (rivet bolt) into the vice by means of clamping jaws for round material
  - Wire projects 6 mm over the clamping jaws!
5. Heading of the rivet head with uniform light hammer blows; finish-forming of the head by means of the header
6. Providing of all the other rivets with button heads as well
7. Bending of the sheet steel; the holes of the side parts have to be situated one upon the other
  - If necessary, ream with the taper reamer!
8. Determining of the length of the rivet shank; sawing of the rivet to the required length; inserting it into the deburred hole, placing on the holder; fastening with the rivet set
  - Length of the rivet for sheet riveting is not identical with that of the sheet-pipe riveting!
9. Heading of the rivet head, finish-forming of the closing head by means of the header
10. Making of all rivetings in this manner
11. Checking of the rivets for clean, uniform button heads, checking of the sheet connection for rigidity
12. Final check
  - Accuracy to size, appearance



**Instruction example 11.4. Waste bin**

Exercising of two-row zigzag riveted joints by means of button-head rivets as rigid connection

Material

– Sheet steel (380 MPa)

Thickness: 1 to 1.5 mm

Width: abt. 900 mm

Length: abt. 1100 mm

– 2 x Steel pipe (380 MPa)

Diameter: 16 mm

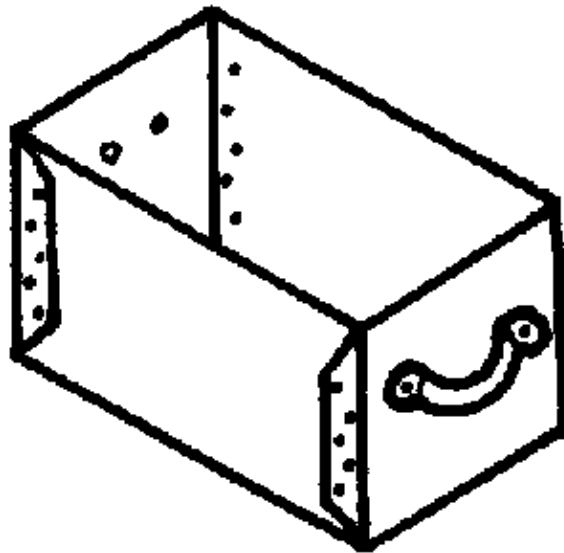
Length: abt. 260 mm

– Button-head rivets (copper)

Diameter: 3  
mm

– 4 x button-head rivets (steel)

Diameter: 5  
mm



#### Hand tools

Steel scribe or marking gauge, centre punch, engineers' hammer, aluminium hammer, hand hacksaw, smooth file 250 mm (flat), drills 3.2 mm dia. and 5.3 mm dia., header for 3 mm rivets and for 5 mm rivets

#### Measuring and testing tools

Steel rule, thin steel square, vernier caliper

#### Accessories

Vice, surface plate, lubricant and coolant (soluble oil), C-clamps, rivet set for 3 mm and 5 mm rivets, holder or riveting support for 3 mm and 5 mm rivets

#### Required previous knowledge

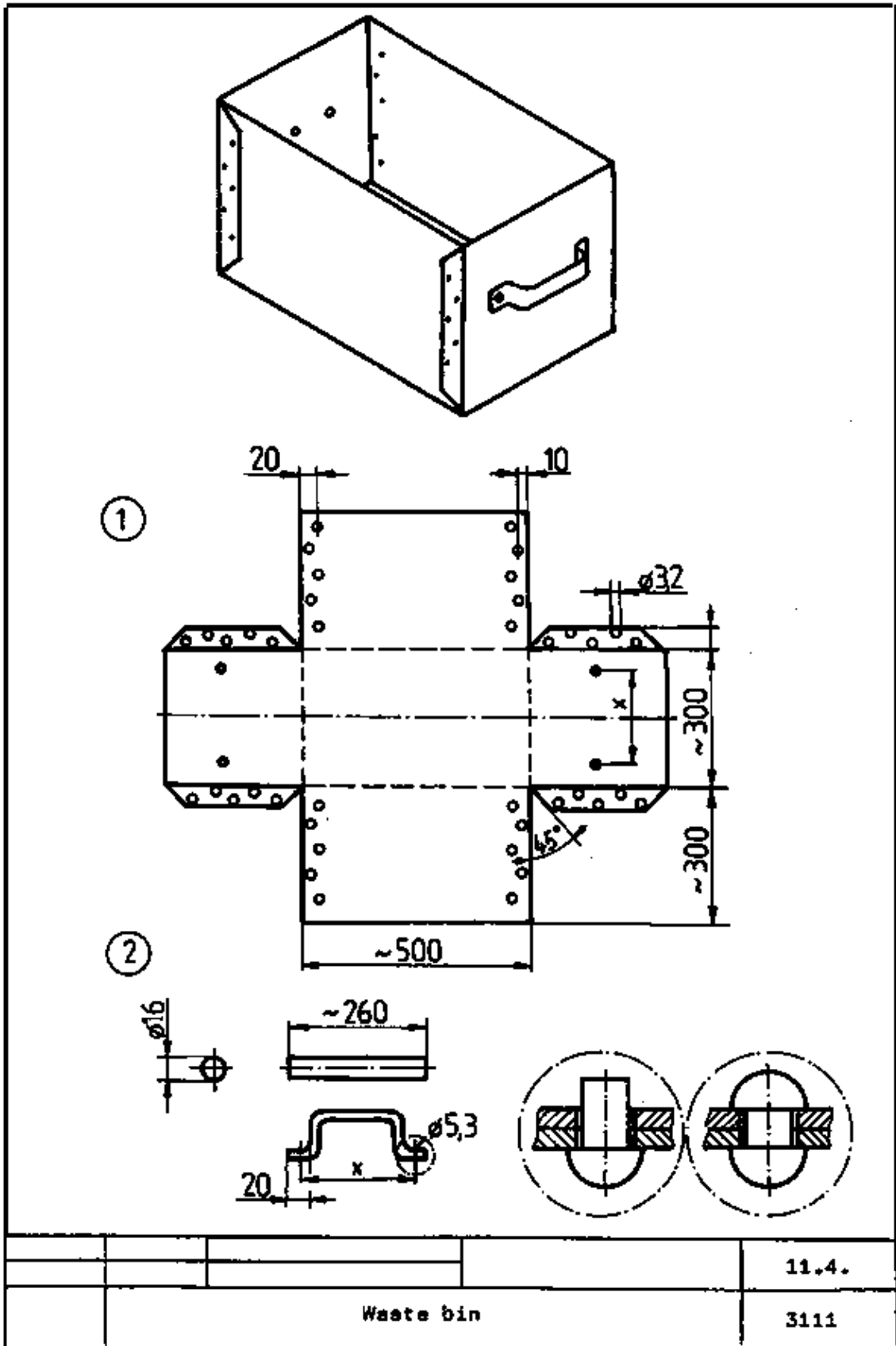
Reading of the drawings, measuring, testing, scribing, prick-punching, sawing, filing, drilling, countersinking/counterboring, hammering

#### Sequence of operations

#### Comments

- |   |  |
|---|--|
| 1. Preparing of the workplace, laying out of the working material   | – Check for completeness                               |
| 2. Preparing the size of the steel sheet according to the drawing   | – Stage (1)<br>Sawing, shearing                        |
| 3. Scribing and punching of the holes (number depends on the size specified) in a zigzag course   | – The number of holes is stipulated by the instructor! |
| 4. Drilling and deburring   |  |
| 5. Bending of the sheet metal, fixing together of overlappings  | – Rework offset holes with a taper reamer!             |
| 6. Determining of the length of the rivet shank, sawing of the rivets to the required length  |  |
| 7. Inserting individually the rivets from outside into the holes; tightening up by means of the rivet set and finish-forming of the closing head on the holder by means of the header | – Finish-form the closing head inside of the bin!      |
| 8. Free bending of the steel pipes in the vice as handles, hammering out 20 mm from the ends, scribing, punching and drilling   | – Stage (2)  |
| 9. Scribing of the handle holes on the bin sides, drilling by the hand drilling machine, deburring  |  |
| 10. Riveting of the handles with the bin  | – Same as operations 6 and 7                           |
| 11. Checking of the rivets for faulty rivetings, checking of the overlappings for close contact and strength  |  |
| 12. Final check   | – Accuracy to size, appearance                         |





Waste bin

### Instruction example 11.5. Key-bolt for cabinets

Exercising of combined button-head and countersunk-head riveted joints as rigid connection between metal sheets

## Material

– Steel sheet (380 MPa)

Thickness: 4 mm

– Part (1) 22 x 130 mm

– Part (2) 52 x 62 mm

– Part (3) 12 x 70 mm or  
8 x 12 x 52 mm

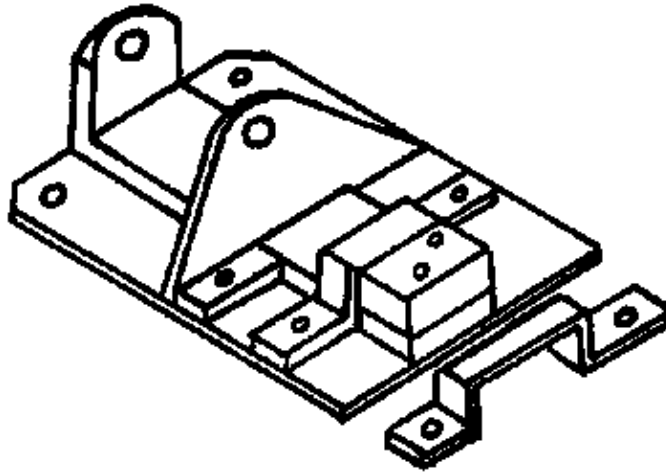
– Part (4) 22 x 27 mm

– Part (5) 52 x 92 mm

– Part (6) 12 x 80 mm or  
12 x 12 x 52 mm

– Part (7) countersunk-head  
rivet 4 mm

– Part (8) button-head  
rivet 4 mm



## Hand tools

Surface gauge, centre punch, engineers' hammer, hand hacksaw, bastard files and smooth files, drills 4.3 mm and 10 mm dia., countersink 75°

## Measuring and testing tools

Vernier caliper, try square

## Accessories

Vice, surface plate, surface plate or anvil, lubricant and coolant (soluble oil), clamp dogs or C-clamps, rivet set for 4 mm rivets, holder for 4 mm rivets

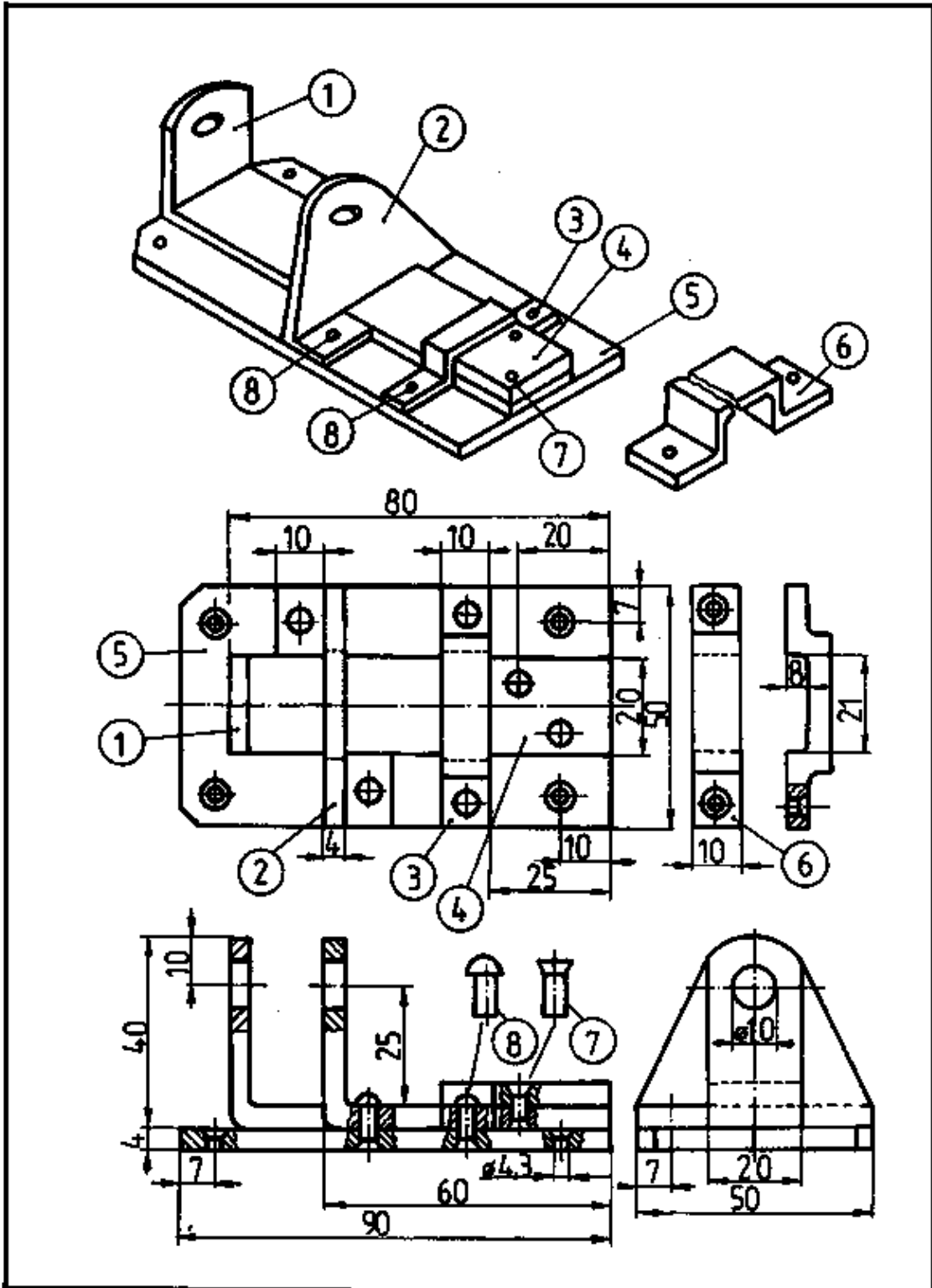
## Required previous knowledge

Reading of the drawings, measuring, testing, scribing, prick-punching, sawing, filing, drilling, countersinking/counterboring

## **Sequence of operations**

## **Comments**

1. Preparing of the workplace, laying out of the working material – Check for completeness
  
2. Preparing the sizes of the individual parts (1) to (6) as per drawing – Sawing, filing, bending
3. Separately drilling and deburring of the parts (2), (3) and (6)
  
4. Fastening of part (1) with part (4), scribing, punching, drilling, countersinking and riveting through part (s) – Countersunk rivet heads to be exactly in alignment with the surface!
  
5. Placing of parts (2) and (3) on part (5) and drilling of the rivet holes, countersinking of part (5) from below
  
6. Firmly riveting of parts (2) and (3) with part (1) inserted on part (5) through part (8)
  
7. Checking of part (1) for easy sliding, checking of the rivet joints for cleanliness and strength
  
8. Drilling and countersinking of holes on part (8) for screwing
  
9. Final check – Accuracy to size, appearance



			11.5.
		Key-bolt for cabinets	3111

Key-bolt for cabinets