

# Blank

## How to design the cast.

version 2020.01

for INDTE students as part of design exercises.

Warsaw 2020

## Introduction

In your project, due to the material (cast iron) and serial production (5000 pieces in 10 series of 500 pieces), a cast should be used as a blank. This number of pieces economically justifies the use of the casting. The design of the semi-finished product should include sand casting.

On fig. 1 selected surfaces are described for part of sleeve class.

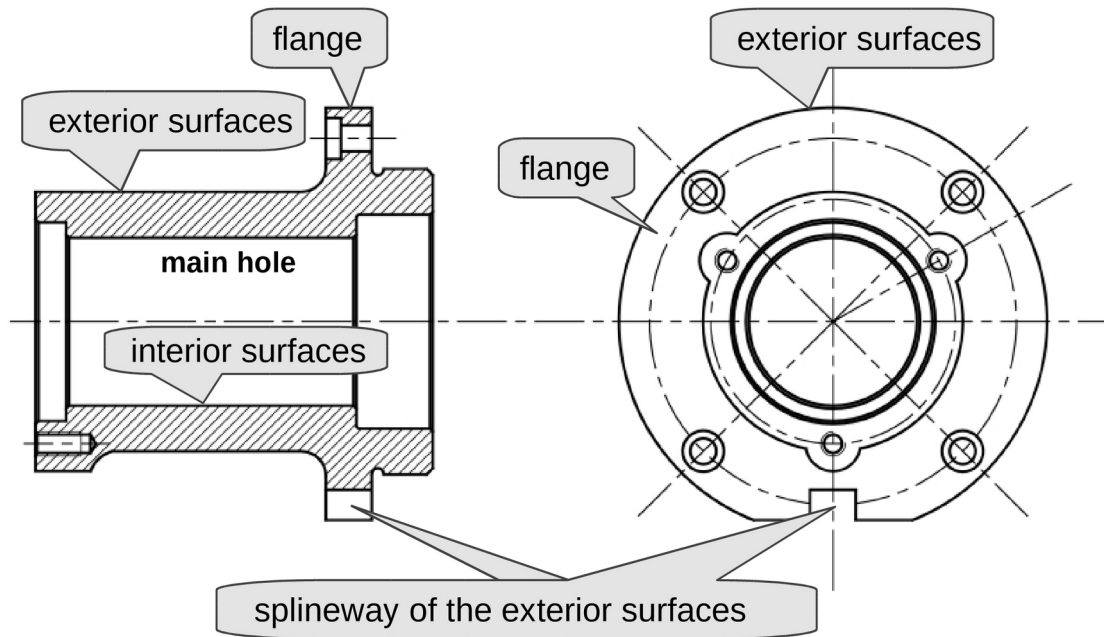


Fig. 1. The selected surfaces of sleeve.

## Casting mould

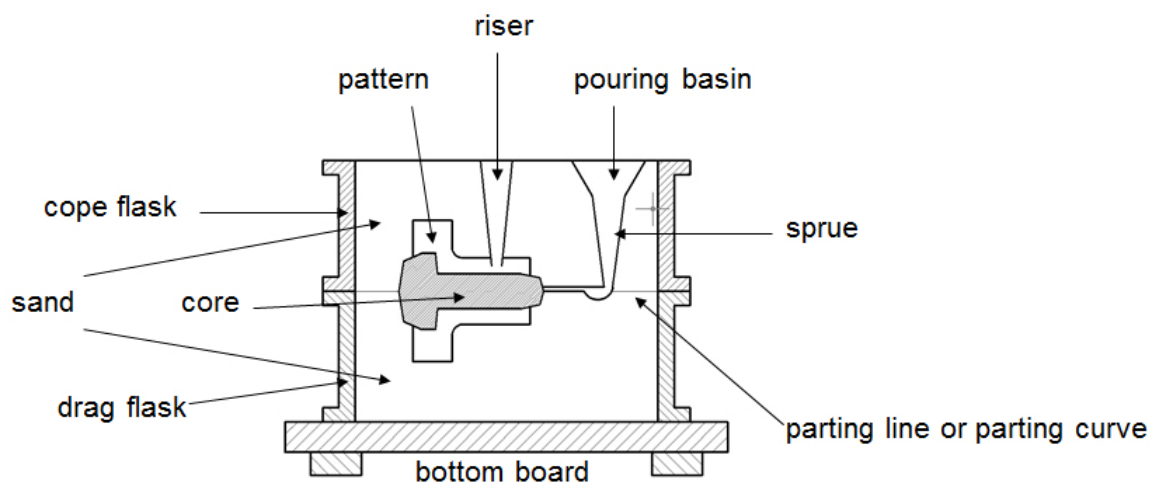
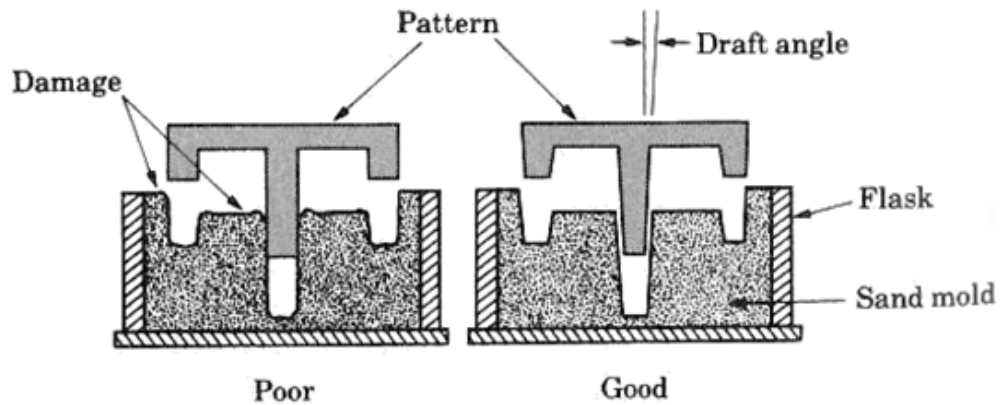


Illustration 2. Structure of the mould.

The mould consists of the bottom (drag flask) and top part (cope flask) – fig. 2. Parting plane (parting line or parting curve) is between bottom and top part of the form. The workpiece project must show location of parting plane with symbols .

Why we apply of taper on patterns of casting – fig. 3.



Taper on patterns for ease of removal from the sand mold.

Fig. 3. Taper on patterns – draft angle ( $2^{\circ}$ - $4^{\circ}$ ).

## Selection of machining allowances and dimension tolerance

A technical standard PN-ISO 8062: February 1997 is the foundation for all casting design activities. We apply the technology of casting in which we accept:

- Grade of tolerance: CT11 or CT12 – table 2.
- Machining allowance ratio: F or G – table 1.

Table 1.

largest dimension mm		Machining allowance for machining (turning, milling etc.) mm									
		Machining allowance ratio for machining									
above	to and inclusive	A <sup>2)</sup>	B <sup>2)</sup>	C	D	E	F	G	H	J	K
—	40	0,1	0,1	0,2	0,3	0,4	0,5	0,5	0,7	1	1,4
40	63	0,1	0,2	0,3	0,3	0,4	0,5	0,7	1	1,4	2
63	100	0,2	0,3	0,4	0,5	0,7	1	1,4	2	2,8	4
100	160	0,3	0,4	0,5	0,8	1,1	1,5	2,2	3	4	6
160	250	0,3	0,5	0,7	1	1,4	2	2,8	4	5,5	8
250	400	0,4	0,7	0,9	1,3	1,8	2,5	3,5	5	7	10
400	630	0,5	0,8	1,1	1,5	2,2	3	4	6	9	12
630	1 000	0,6	0,9	1,2	1,8	2,5	3,5	5	7	10	14
1 000	1 600	0,7	1	1,4	2	2,8	4	5,5	8	11	16
1 600	2 500	0,8	1,1	1,6	2,2	3,2	4,5	6	9	13	18
2 500	4 000	0,9	1,3	1,8	2,5	3,5	5	7	10	14	20
4 000	6 300	1	1,4	2	2,8	4	5,5	8	11	16	22
6 300	10 000	1,1	1,5	2,2	3	4,5	6	9	12	17	24

Table 2.

Basic dimension of the rough casting		Tolerance range of the cast mm															
		Grade of tolerance of the cast CT															
above	to and inclusive	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
—	10	0,09	0,13	0,18	0,26	0,36	0,52	0,74	1	1,5	2	2,8	4,2	—	—	—	—
10	16	0,1	0,14	0,2	0,28	0,38	0,54	0,78	1,1	1,6	2,2	3	4,4	—	—	—	—
16	25	0,11	0,15	0,22	0,3	0,42	0,58	0,82	1,2	1,7	2,4	3,2	4,6	6	8	10	12
25	40	0,12	0,17	0,24	0,32	0,46	0,64	0,9	1,3	1,8	2,6	3,6	5	7	9	11	14
40	63	0,13	0,18	0,26	0,36	0,5	0,7	1	1,4	2	2,8	4	5,6	8	10	12	16
63	100	0,14	0,2	0,28	0,4	0,56	0,78	1,1	1,6	2,2	3,2	4,4	6	9	11	14	18
100	160	0,15	0,22	0,3	0,44	0,62	0,88	1,2	1,8	2,5	3,6	5	7	10	12	16	20
160	250	—	0,24	0,34	0,5	0,7	1	1,4	2	2,8	4	5,6	8	11	14	18	22
250	400	—	—	0,4	0,56	0,78	1,1	1,6	2,2	3,2	4,4	6,2	9	12	16	20	25
400	630	—	—	—	0,64	0,9	1,2	1,8	2,6	3,6	5	7	10	14	18	22	28
630	1 000	—	—	—	—	1	1,4	2	2,8	4	6	8	11	16	20	25	32
1 000	1 600	—	—	—	—	—	1,6	2,2	3,2	4,6	7	9	13	18	23	29	37
1 600	2 500	—	—	—	—	—	—	2,6	3,8	5,4	8	10	15	21	26	33	42
2 500	4 000	—	—	—	—	—	—	—	4,4	6,2	9	12	17	24	30	38	49
4 000	6 300	—	—	—	—	—	—	—	—	7	10	14	20	28	35	44	56
6 300	10 000	—	—	—	—	—	—	—	—	—	11	16	23	32	40	50	64

Examples of cast design with machining allowances (first exercise design – blank), fig. 4.

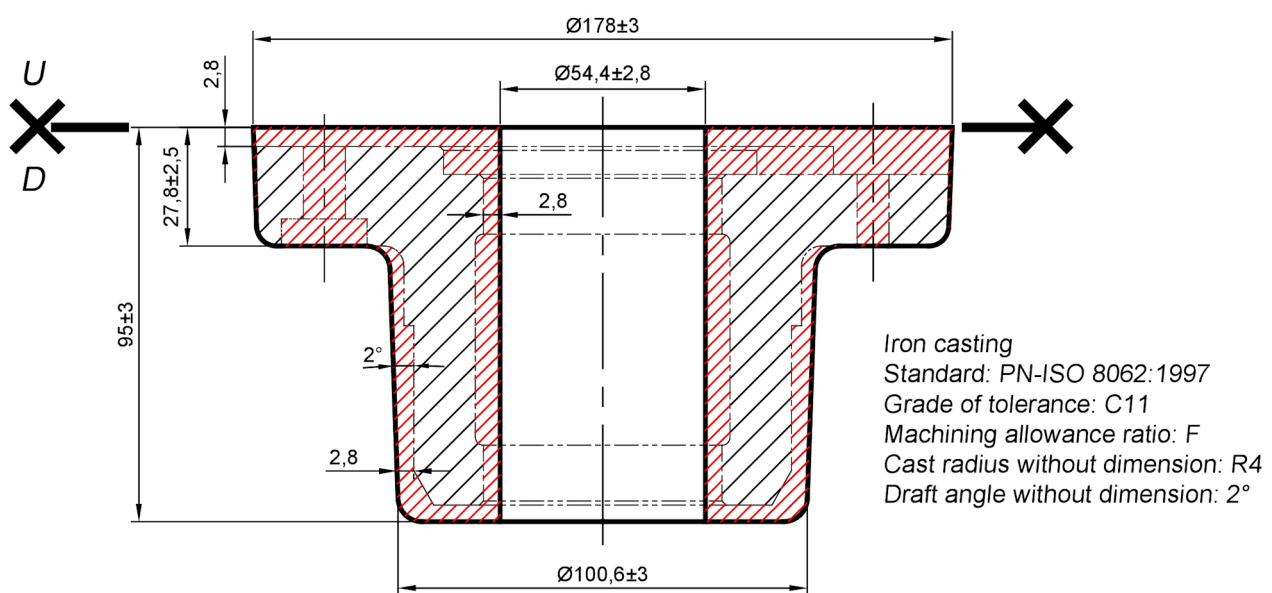


Fig.4. An example of a cast design drawing as a blank.

In figure 4 we see a cross section of the blank. Thick lines indicate the outline of the blank. Thin hatching means that we are dealing with a cross-section. Double-dense hatching, additionally marked in red, indicates machining allowances. The use of red is not recommended but in the didactic context it is an important help. To the left of the figure is the draft angle dimension. In the description of the drawings there is information that the draft angle without dimension is 2. In the drawing we insert the dimension or when all, e.g. draft angles are the same, you can only insert a verbal note as shown in the description on the right of the drawing.

Figure 4 shows one view of the blank as a cast because it is a structure that is fully symmetrical about the axis of the object. If the flange (disk) does not have a cylindrical shape, it is necessary to show a supplementary projection.