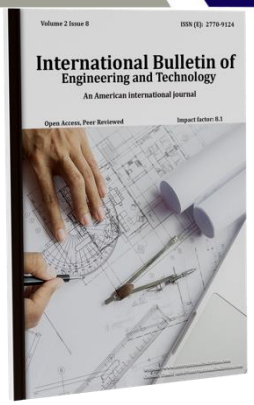

USE OF MEASURING INSTRUMENTS

Abduxakim Nigmatovich Abdullayev
Tashkent State Pedagogical University, Department of "Technological Education Methodology",assistant professor,Tashkent city.
abdullayeva.abduhakim.1967@gmail.com
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ANNOTATION: Methods of determining the dimensions of details using measurement; study the structure of the instruments and devices used in measurement and the process of their use; labor safety rules during measurement work; study of defects that may occur in measurement and methods of their prevention and elimination.

KEY WORDS: measuring, detail, tools, measuring with a ruler made of metal, circle circle, nutrometer, rod circle, protractor, external size.

RESULTS: When using measuring instruments, it is necessary to observe certain rules, in particular, these rules applied to the barbell instrument are as follows:

1. Checking the integrity of the device.
2. Before starting work, wash the barbell tool in gasoline, then wipe it with a soft clean cloth to remove oil and dust (especially, thoroughly clean the measuring surface); conducting a current inspection of the device according to the instructions.
3. Never clean the device with a paper towel or a knife.
4. Only clean and dry surfaces of the part can be measured.
5. Measurement should be carried out with dry and clean hands.
6. Do not place the barbell tool on heat sources and do not keep it in sunlight.
7. Do not touch the measuring surfaces of the instruments with your hands.
8. Before measuring, check the instrument according to the instructions.
9. Periodically submit the tool to the tool room for full inspection.
10. Do not measure over-cooled details.
11. Do not use excessive force during measurements (force should be around 0.6-1N).
12. It is not allowed to measure moving and rotating parts.
13. Careful use of tools: protection from shocks;
14. When the work is finished, wash the tool, wipe it with gasoline, lubricate it with anti-corrosion oil and put it in its case.
15. Store the device in a dry place protected from sunlight and protected from artificial heating at a temperature not lower than 5°C.
16. To know the construction of the instrument used in measurement, the basic requirements for preparing it for use, as well as the rules of operation.
17. Thoroughly study the methods and rules of measuring with the most commonly used tools in plumbing work.

DISCUSSION:

Job duties:

1. Measuring with a metal ruler.
2. Measuring with a chroncircular and nutrometer.

3. Measuring with a barbell.
4. Measuring with a micrometer.
5. Measure angles with a protractor.
6. Measure the gap with a pencil.

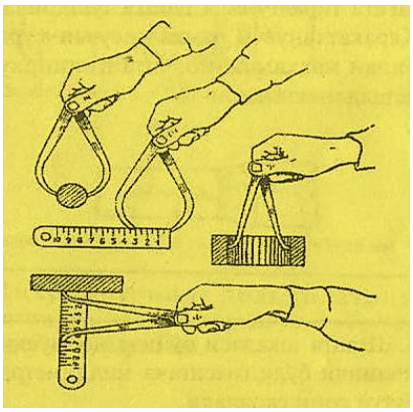
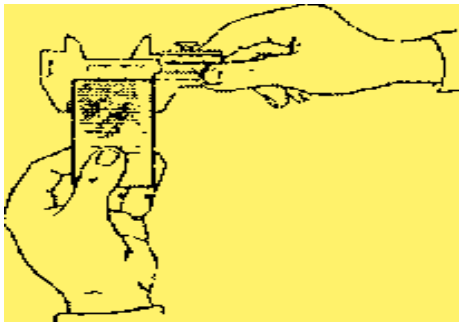
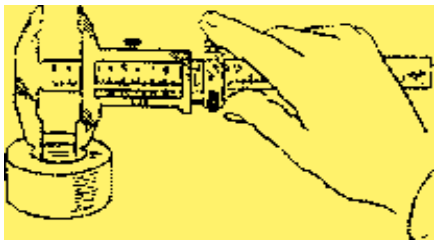
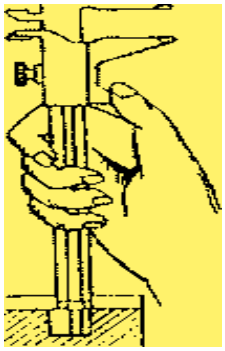
Equipment and tools: metal measuring rulers, compasses, calipers, barbells graduated from 0.1 and 0.05 mm; 0.25 mm micrometers, protractors with measurement accuracy 2 and 4, pencils.

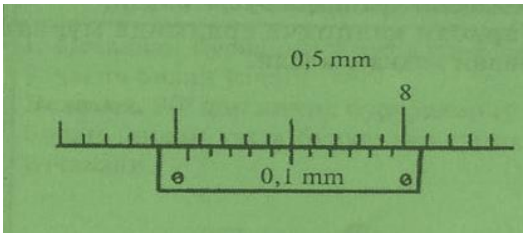
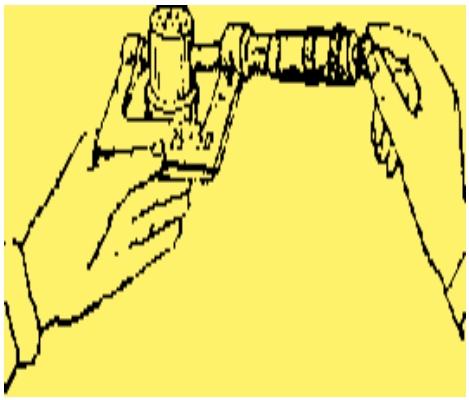
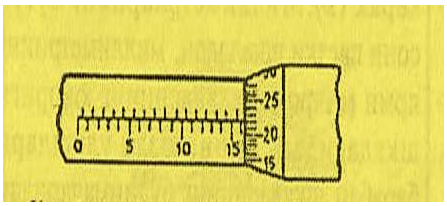
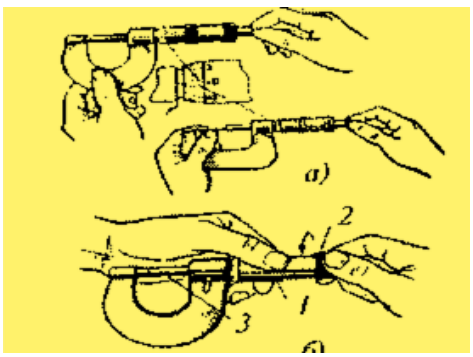
It is possible to increase the accuracy of the measurement if the measurement is carried out several times with the same instrument in the same place, at the same temperature. After the measurements, the arithmetic mean value of the measured quantity is found by adding the results and then dividing by the number of measurements. This value is much closer to the actual size than the result of one measurement.

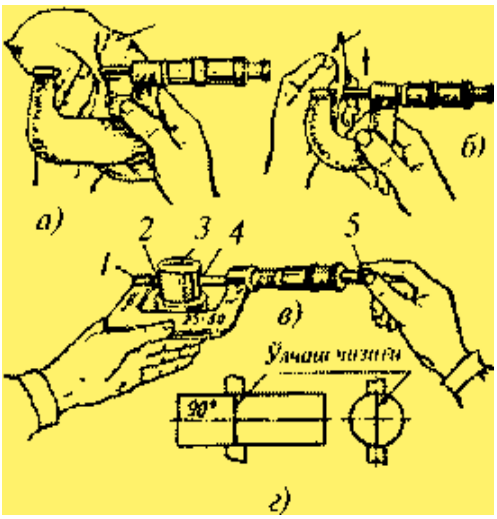
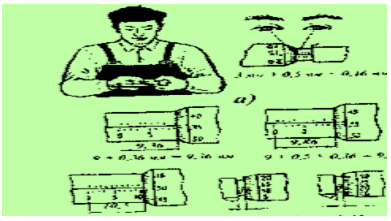
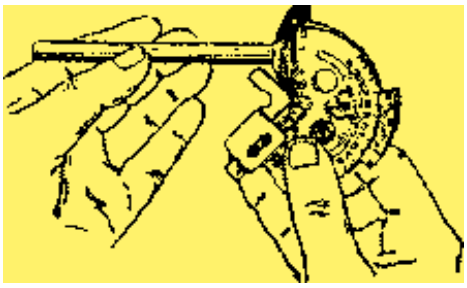
In the work report: the purpose and tasks of the work, the necessary equipment, the order of the work, the rules of the measuring technique are indicated.

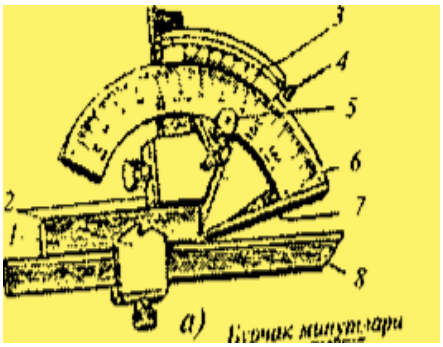
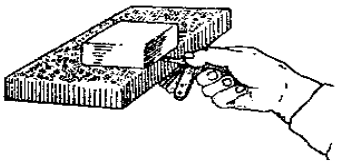
Order of work

Measuring with a metal ruler	
1. Place the ruler on the measured details. Reminder. When measuring parts of regular shape (plate, core-stud, etc.), it is recommended to stick them on something. 	1. The ruler is placed on the surface of the part to be measured, and its side edge is pressed against a curve in the part or something that clamps the part (see the picture). The zero division of the ruler should be accurate and coincide with the end of the measured part of the detail. 2. When determining the size, the eye should be directly in front of the scale.
Measuring with a chroncircular and nutrometer	
1. Measure the detail. Reminder. It is necessary to measure the outer dimensions with a circle ring, and only the inner dimensions with a nutrometer.	1. Kroncircular (nutromer) legs larger than the detail or hole size is cut to size.By slightly hitting the part with one leg of the circular ring, both lips of the circular ring are touched to the part (hole) being measured.

2. Size  reading.	2. One lip of the circle is placed on the edge of the ruler, the other is placed on the scale of the ruler without tilting, and the size is read. The ruler is drawn to an object with the zero end, one leg of the nutromer is tilted to its zero division, the other leg is the ruler without skewing to scale is placed and the size is read.
Measuring with a barbell	
1. Measurement of external size 	1. Take out the bar ring and loosen the clamping bolt of the frame. The lips of the barbell are enlarged in the detail size. The lips of the movable frame are moved until they touch the surface of the part to be measured. It is fixed with a clamping bolt, and the barbell is removed from the detail.
2. Measure the internal size 	2. Lips are smaller than the size of the hole. Small lips are inserted into the hole and pushed until the lips of the movable frame touch the walls of the hole. The movable frame is fixed with bolts, and the barbell is removed from the detail.
3. Depth measurement 	3. The side edge of the bar is pressed against the upper edge of the hole or hole to be measured. The depth gauge of the movable lip is lowered until it rests against the bottom of the hole or notch. The movable frame is fixed with a clamping bolt, and the barbell is removed from the detail.

4. Read the barometer  	4. The whole number of millimeters is counted to the zero division of the vernier on the bar scale. It is determined that the division of the vernier corresponds to one of the divisions of the barbell. The number of decimal or hundredths of a millimeter is determined by multiplying the number of intervals between the zero division of the vernier and the corresponding division of the bar by the value of the measuring accuracy of the bar circle.
Measuring with a micrometer	
1. Measure the detail 	1. Holding the handle of the micrometer, take it with the left hand and turn the drum counterclockwise with the right hand, and the measuring plane of the micrometer is reduced to a size larger than the part to be measured. The workpiece is placed between the heel of the micrometer handle and the side edge of the micrometer bolt, and the ratchet is smoothly rotated clockwise, the side of the micrometer bolt, and the heel of the handle ring are turned until they touch the part to be measured and the typical release sound of the ratchet mechanism is heard. . The position of the micrometric bolt is secured by a stopper.
2. Reading the micrometer..  	2. Millimeters and half millimeters are counted by the number of divisions in the body of the micrometer bushing. Hundredths of a millimeter is determined by the degree to which the cone of the drum coincides with the longitudinal line of the body.
3. Set the zero position of the micrometer and adjust it when the zero lines do not match.  	3. When the zero lines do not overlap, the micrometer is adjusted: the measuring planes are aligned and stopped using the micrometric bolt stop; the cap connecting the drum with the micrometric bolt is released; the drum is bolted using a cap.

4. Measuring with a micrometer. 	4. The measuring surfaces are wiped with soft gauze (a) or paper (b). The micrometer is set to a size slightly larger than the size being checked. Holding the middle of the micrometer handle, the part to be measured is placed between the heel and the micrometer bolt (V). The finger of the right hand is turned smoothly with the fingers of the right hand, and the side edge of the micrometer bolt touches the part heel until it touches the surface of the part being tested, and the ball turns until it clicks. is squeezed. When measuring a detail, the measuring line should pass through the center of the detail (g).
5. Examples of instrument position and counting when reading micrometer readings. 	5. The micrometer should be held over the eyes (a). The whole number of millimeters should be counted from the lower scale, half of a millimeter from the upper scale of the micrometer body, its face parts should be counted from the divisions of the drum scale along the line that overlaps with the longitudinal line on the bushing (in the given figure (b) count, see the methods of obtaining shown).
Measure angles with a protractor	
1. Measure the angle from the detail with a type 1 protractor. Reminder. Angles less than 90° are measured with a gouge, angles greater than 90° are measured without a gouge. 	1. The angle measuring sector is set in such a position that the angle between the removable ruler and the edge of the gouge is slightly larger than the measured angle of the part. One edge of the measured angle in the part is placed on the removable ruler of the protractor, the moving ruler is pushed so that the gap between the sides of the measured angle of the part and the burr and the edges of the removable ruler of the protractor is the same be different. The sector is fixed with a stopper.
2. Determine the value of the angle.	2. The whole number of degrees is counted up to the zero division of the vernier on the scale based on the ruler. It is determined which division of the vernier corresponds to one of the divisions of the basic scale. The intervals between the zero division of the vernier and the corresponding base division are multiplied by the value of the accuracy of measurement with a protractor, and the number of minutes is determined.
3. The structure of the protractor	3. the ruler is used to measure external angles from 0

and its vernier.  	to 180° and internal angles from 40 to 180°; the size of the counting head according to the vernier is 2 (minute); to measure external angles from 0 to 1800; The size of the vernier head is 2 (minutes). get acquainted with the structure of the protractor (a). Get acquainted with the structure of the nonius (b); the angle between the edge lines of the vernier is equal to 29^0 and is divided into 30 parts, but unlike the protractor, this vernier is built on an arc with a large radius, so the distance between the lines is large, which makes it easier to read the indicators.
Measure the slots with a pencil	
1. Measure the gap.	1. One plate of the pen or a set of plates is placed in the slot in such a way that they enter the slot tightly and completely. Inserting the stylus plates into the slot does not require much force to avoid breaking them.
2. Determining the size of the slit. 	2. If only one plate enters the slot, the thickness of this plate determines the value of the slot. If the gap is measured with a stack of plates, its value is equal to the sum of the thicknesses of these plates.

CONCLUSION:

Selection of measuring tools and measurement errors

Measuring tools are indicated in technological documents used by workers. Their correct selection is achieved by marking (marking) measuring instruments.When choosing measuring tools, it is necessary to take into account the accuracy of the preparation of the item, the efficiency and economy of the measuring method. The lower the cost for the preparation (assembly, repair) of the item and the higher the required accuracy, the more accurate the measuring instrument should be. when choosing, you should not choose more precisely than is required to achieve the required quality of the product. For example, to check the dimensions after casting, hot molding and hammering, a circle ring, nutrometer, ruler are enough, because the specified dimensions and tolerances for their preparation are given in whole millimeters. In rough processing (turning, cutting), the accuracy of a bar circle with a division value of 0.1 mm is sufficient. Depending on the dimensions and placement of the items, approximate information on the selection of universal measuring tools for external and internal surfaces The measurement can be carried out somewhat close to the object, because no matter how carefully this process is carried out, it is often associated with errors (the difference between the actual value of the measured quantity and the measurement result is called the measurement error The measurement result can be larger or smaller than the actual size, that is, the measurement error can be positive or negative. The value of measurement error depends on several reasons, the main ones are:

the device is defective or in bad condition (corners are damaged, dirty, the position of the zero mark is incorrect);

incorrect setting of the tool to the part or the measured part to the tool;
overheating of the device;
wrong choice of measuring instrument or inability to use it;
the presence of unevenness or other defects on the surface of the detail;
the presence of small flakes, impurities or oil on the measuring surface of the part.

References:

1. Abdullayev, A. (2023). METHODS OF PROBLEM SOLVING IN THEORETICAL MECHANICS COURSES. International Bulletin of Applied Science and Technology, 3(9), 282-287.
2. Abdullayev, AN (2023). Machine and mechanism theory of machine and mechanism design and research general methods . "Innovative solutions to technical, engineering and technological problems of production" International scientific and technical conference October 28-29, 2022, 829-833.
3. Abdullayev, AN (2023). Methodology of problem solving in practical lessons from applied mechanics. Proceedings of International Conference on Educational Discoveries and Humanities Open Access | Peer Reviewed | Conference Proceedings www.econferenceseries.com Volume 1, 1st October 2022 . 75-79
4. Abdullayev, AN (2023). Pedagogical Description of the Formation of Professional Competence in Students of a Higher Education Institution . Vol. 4 No. 2 (2023): AJSHR March 9, 2023 . American journal ajshr , "Global Research Network LLC" ISSN: 2690-9626 (online), Published by "Global Research Network LLC" under Volume: 4 Issue: 2 in Feb-2023 https://globalresearchnetwork .us/ index.php / ajshr
5. Abdullayev, AN (2023). Methodology of labor education as one of the branches of pedagogy . pedagogical sciences and teaching methods conference . Copenhagen "Science Edition" 17 February 2023 .
6. Abdullayev, AN (2023). Methodology of problem solving in technical mechanics classes. Scientific electronic magazine "Science and Education". Volume 4 Issue 4 https://drive.google.com/file/d/1GJzuiTGK_lTj7HReL8Pl6 _yMqytgpgj1/view?usp=share_link . ISSN 2181-0842 . APRIL 2023 . 684-688