

MINISTRY OF HEALTH OF UKRAINE
O.O. BOGOMOLETS NATIONAL MEDICAL UNIVERSITY

“Approved”

at the methodological conference of hygiene
and ecology department

Head of the department

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GUIDELINES
FOR STUDENTS

<i>Subject</i>	Hygiene and ecology
<i>Module № 1</i>	Assessment of the environment and its impact on the population health
<i>Submodule № 5</i>	Hygiene of children and adolescents
<i>Topic of the lesson</i>	Hygienic requirements to planning, improvement and equipment of educational establishments for children.
<i>Course</i>	6
<i>Faculty</i>	medical
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Kiev

1. Learning objective

1.1. Strengthen theoretical knowledge about significance of optimal hygienic conditions maintenance during organization of training and education for preservation and strengthening of schoolchildren health, prevention of “school diseases” appearance.

1.2. Become familiar with methods of hygienic assessment of land plot and building of educational establishment, its main premises (school class), inspection of conditions for schoolchildren in educational establishment, working out and substantiation of hygienic recommendations for improvement of the training and education organization.

1.3. Master method of hygienic assessment of school furniture.

2. Basics

2.1. You should know:

2.1.1. Peculiarities of main environmental factors and conditions, training and education, which influence the children and adolescents health.

2.1.2. Health disorders and diseases caused by influence of environmental conditions, training and education.

2.1.3. Hygienic requirements to land plot and building, planning, sanitary and technical infrastructure (microclimate parameters, illumination, ventilation, water-supply etc.) of main premises of training and educational establishments.

2.1.4. Hygienic requirements to construction and certain parameters of school furniture.

2.2. You should have the following skills:

2.2.1. To draw up the plan of inspection of training premise and fill appropriate papers (sanitary description, sanitary inspection act, hygienic conclusion).

2.2.2. To research temperature regime, humidity and air movement, illumination, calculate required and actual ventilation volume and rate (air exchange rate).

2.2.3. To determine main parameters of school furniture, carry out the school desk marking and pupils seating.

2.2.4. To work out and substantiate preventive recommendations concerning improvement of sanitary and hygienic conditions of pupils stay in schoolhouse.

3. Self-training questions

3.1. Factors and conditions of environment, training and education which influence the children and adolescents health.

3.2. Health disorders and diseases caused by influence of environment factors and conditions during the stay at the educational establishment.

3.3. Hygienic requirements to land plot, building and group section of children preschool establishment. Principle of group isolation and its significance.

3.4. Hygienic requirements to land plot and building of general (not specialized) schoolhouse. Principle of functional zoning and its significance.

3.5. Hygienic requirements to planning, maintenance, equipment, microclimate, ventilation and illumination, sanitary and technical infrastructure of main schoolhouse premises.

3.6. Method of hygienic assessment of pupils stay and education in modern schoolhouses.

3.7. Hygienic requirements to school furniture and their physiological substantiation.

3.8. Rules of school desks and other school furniture marking, pupils seating. Hygienic requirements to school desks location in school class.

3.9. Main preventive measures concerning improvement of sanitary and hygienic conditions of pupils stay in modern school houses.

4. Self-training assignments

4.1. School class for 40 pupils has following parameters: 8 meters length, 6 meters width, 3.2 meters height. 2 exhaust ducts, located in upper part of interior wall, and window vent sashes provide natural ventilation. Ventilation rate (air exchange rate) is 2 times per hour. 3 windows 2×1.5 m size each provide natural lighting, artificial illumination is provided by 9 150 Wt incandescent lamps, which have directed-diffused lighting fixture and are held 3 meters above the floor. 20 school desks are arranged in 3 rows: 7 school desks in side rows, 6 school desks and teacher desk in middle row. Does this school class meet all requirements?

4.2. There are 31 eighth year pupils. They have following parameters: body length 130–145 cm for 4 pupils, 146–160 cm – for 10 pupils, 161–175 cm – for 17 pupils. School furniture for these pupils has such parameters: 9 school desks have 640 mm height of the desk, 380 mm height of the seat; 7 school desks – 700 mm height of the desk and 420 mm height of the seat. Determine the accuracy of the school furniture choice for these pupils and substantiate corresponding hygienic recommendations if it is necessary.

4.3. There are three seventh-year pupils. First of them is 170 cm tall and suffers from middle stage miopya, second is 168 cm tall, is ill frequently during long period of time, third is 172 cm tall boy and has hearing loss of medium and high audio frequency. Determine the number of school furniture and propose the most optimal place for these pupils' seating.

5. Structure and content of the lesson (duration of the lesson 160 min + 10 min break)

5.1. Preamble – 5-10 min.

5.2. Test control for assessment of students' knowledge datum level – 10-15 min

5.3. Theoretical training – 30-40 min.

5.4. Typical situational tasks "Krok-2" solution – 30-40 min.

5.5. State exams situational tasks solution – 30-40 min.

5.6. Test control for assessment of students' knowledge final level – 10-15 min.

TRAINING INSTRUCTION

on hygienic assessment of land plot, building, training premise (school class) and conditions of pupils' stay at the schoolhouse

Land plots for general educational establishment buildings must be located in settlement, meet sanitary norms concerning appropriate distance from points of harmful substance emission, noise, vibration, electromagnetic and ionizing irradiation. It is prohibited to locate educational establishments in sanitary-protection zones of industrial enterprises and other objects which can be potential sources of environment pollution with dangerous factors. Building at the land parcel is allowed if all technical documentation for power and water supply, sewerage, heating etc. are presented and approved by territorial establishments of State sanitary and epidemiological service of Ministry of Public Health of Ukraine.

Sanitary-protection zone width between border of school land plot and surrounding objects must be not less than 50 meters. Building of general must be located at 100-170 meters distance from driveway.

Service radius - distance from pupils' residence to general educational establishment must be not more than 0.5 km on foot. Thus, in case of access using public transport, the most acceptable radius for pupils of I level (elementary school) is 15 minutes travel, pupils of II-III level (main or incomplete secondary and secondary or high school) – 30 minutes.

Service radius for schools of I level in rural areas must be not more than 2 km and not more than 15 minutes to school on foot. Maximum service radius of pupils of II-III level of school may not exceed 15 km.

Special transport (school bus) must be used to take pupils to educational establishment in rural areas. Pupils, who live at 3 km and more distance from school, must be served by transport with pre-determined stops. Distance from resident place to the stop of such transport must not exceed 500 meters.

Buildings of general schools are located not more than 25 meters distance from red line of the land plot. Distance from border of school plot to residential building walls with entrances and windows must be more than 10 meters.

Green protection zone (trees, bushes, laws) of 1.5 meters wide (from street side – not more than 3 meters) is provided along the perimeter of the land plot.

There is 1.2 meters high fence around the territory of educational establishment. It is allowed to use 1 meter high green fence if schoolhouse is located inside residential areas.

Green area of land plot of general education establishment must be 45-50% from its total area. Green area may be decreased to 30% if land plot is adjoin to green areas (parks, gardens, squares) or school is located in rural area.

Type of allocation and orientation of main functional premises in general establishments must provide permanent 3-hour duration insolation per day. Due to this, tall trees are planted not more than 10 meters distance from educational establishment walls with windows, bushes – not more than 5 meters distance. It is prohibited to plant thorn trees, bushes and plants with poisonous berries, grow mushrooms near the school.

Land plot of general educational establishment is divided on following *functional*

zones: training zone, training and labour zone, training and research zone, physical training and sport zone, rest zone, economical zone, residential zone and agricultural zone (for schools in rural areas).

Data concerning *content and area of certain functional zones of land plot of general school* are presented in table 1.

Table 1

Contents and area of certain functional zones of land plot of general school, m²

<i>Zone</i>	<i>Elementary school</i>	<i>Main (incomplete secondary)</i>	<i>Secondary (high)</i>
1. Training and research zone:			
– area for elementary classes	200	200	400
– meteorological and geographic areas	–	50	100
– class to study outside (with covering)	–	20	30
– area for vegetables	–	800	1200
– orchard and seed-plot of flower and ornamental plants	40	100	400
– greenhouse with zoo area	–	170	170
– zoo area	–	100	100
– area of plant collection	–	70	350
– area for primary pre-conscription training			1000
i n c l u d i n g :			
– <i>training place for tactical training and civic defence</i>			500
– <i>area for grenade throwing</i>	–	–	500
2. Physical training and sport zone:			
– school stadium with 250 m running-track and 100 m straight running-track, combined field (60 m x 28 m) for football playing, area for handball playing with two sectors for high and broad jumping etc.	–	4200	4200
– areas for sport games:			
– <i>volleyball and basketball</i>	162	364	526
– <i>area for gymnastics (1–4 years pupils)</i>	200	200	200
– <i>area for gymnastics (5–12 years pupils)</i>	–	200	200
– <i>combined area for sport games, ball throwing, high and broad jumping</i>	480	480	480
3. Rest zone:			
– areas for outdoor games for 1 year pupils	100	100	100
– areas for outdoor games for 2–4 years pupils	300	300	300
– areas for outdoor games for 5–12 years	–	–	125

pupils			
– areas for calm rest for 5-12 years pupils	–	–	160

It is useful to locate the *physical training and sport zone* along the land plot from North to South near the training zone but not near the windows of elementary school premises.

Areas for outdoor games with ball and throwing of sport equipment are located not more than 25 meters distance from windows of training and training and additional premises of schoolhouse building, areas for other types of physical training – not more than 10 meters distance.

Sport areas must be with hard and obligatory flat surface for trauma prevention. Running track is equipped around football ground and includes straight 100 meters running track for sprinter competition.

Pits for high and broad jumping must be filled with sand mixed with sawdust, their borders are covered with rubber except front one. Drainage systems are necessary in the design of running tracks and sport areas (for volleyball, basketball, handball).

Combined area (if they are equipped) may be paved with asphalt or cement, but football ground must be covered with grass obligatory. It is prohibited to carry out physical training in damped areas.

Areas for 1-4 years pupils must be equipped with shadow shelters, descending hills, swing, cement wall for playing with ball, benches, hard surface tracks for roller skating and bicycling, shallow swimming pool etc.

All children must be familiar with rules of the sport inventory and equipment usage. Sportswear and shoes must obligatory be dressed during physical training at sports grounds.

Areas for physical training are fenced with green plantations from each other. Play areas are sown with low grass if they are near the schoolhouse building.

Economical zone has separate entrance and is located near the training (training and field) zone and canteen premises. There are repair shops, storehouses, garages, garbage recipients, barn and manufacture premises in this zone. Garbage tanks are closed with lids tightly and located at not more than 25 meters distance from canteen windows and entrance on asphalted or cemented ground under the shelter.

There is an asphalt or cement surface on approaches to schoolhouse building (not more than 100 meters distance) driveway, pedestrian approaches to economical premises and outdoor public conveniences in rural schools without sewerage.

Campuses for pupils, and if required – teachers and other personnel are located in the *residential area* of the land plot, which must have separate entrance from the streets and driveways and be at least 100 meters far and isolated from the economical zone.

Sanitary gaps between sleeping buildings and residential zone border must be not less than 50 meters distance. Distance between sleeping buildings and motorway must be not less than 150 meters, to economical zone – not less than 100 meters.

Areas for outdoor games of *rest zone* are located near premises exit and divided between pupils of each age group for their maximum usage during breaks.

It is prohibited to use enclosed court of schoolhouses for economical needs (car parking, location of furniture, equipment, spoil sheet, metal scrap and construction

materials).

Training and research zone must be not more than 25% of total land parcel area. This zone may be decreased in urban schools to make room for hotbeds, greenhouses and conservatories, connected with complex of studying rooms of natural direction (biology, chemistry).

Land parcels of rural schools may be enlarged at the account of hotbeds, greenhouses, conservatories, premises for agricultural engineering, lawn-and-garden inventory storage.

Building of general educational establishment must provide optimal conditions for the pupils' training and education, rest and nutrition. Based on the above, it is necessary to locate this building such way that lighting and insolation level of training premises would be optimal, connection between land parcel and building – the most rational.

There are compact, block (block-section) and pavilion systems of architectural and planning compositions to maintain educational establishments (fig. 39.1). Two last of them are the most advisable for usage in modern conditions. There are maximum three parallel classes for same age children or two parallels for adjacent age groups (1 and 2 years pupils, 3 and 4 years pupils etc.) in one section.

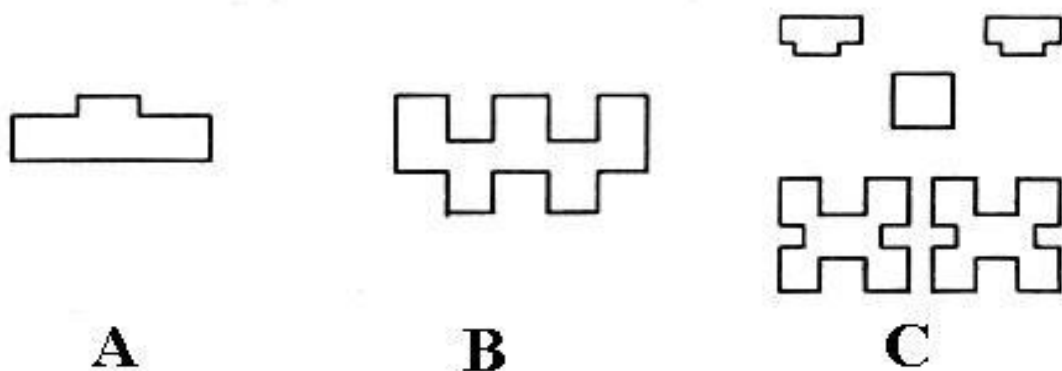


Fig. 39.1 Main types of architectural and planning compositions of educational establishment buildings
(A – compact; B – block; C – pavilion)

Buildings of general educational establishments must have not more than three floors. If such type of educational establishment is located in previously built four or five floor premises, rooms with minimum load are located at fourth and fifth floors.

Number of pupils in school must not exceed the projected capacity in modern educational establishments.

There are *functional groups of training premises* such as classrooms, study rooms, laboratories, blocks (rooms) for working education and occupational orientation, extended day rooms, physical training and sport premises, canteen premises, medical block, assembly hall, library, administrative and supplementary premises etc. in educational establishment building.

Data concerning *contents and recommended area of main premises of general educational establishment* are represented in table 2. Areas of premises are given taking into account that a classroom is for 25 pupils. If there are 30 pupils in a classroom in general schoolhouse, it is allowable to use the area of classrooms, universal study and specialized rooms accounting for 2.0 m² area per 1 pupil for general classrooms and

2.4 m² per 1 pupil – for laboratories of natural sciences.

Table 2

Contents and recommended area of main premises of general school

<i>Name of premise</i>	<i>Area per one pupil, m²</i>	<i>Note</i>
1. Premises for school of I level (1–4 years):		
<i>Premises for pupils of 1st year:</i>		
– classroom	2.4	
– sleeping room	2.0	
– game room	2.0	
– recreation	1.0	
– toilets	0.2	
– cloakroom	0.2	
<i>Premises for pupils of 2nd-4th years:</i>		
– classrooms	2.4	
– premises for pupils on duty (for each class)		wardrobe for clothes 3 m ² , wardrobe for technical equipment
– sleeping rooms for pupils with health disorders	2.0	
– workshop for working education of younger pupils (for 25 places with inventory)	3.6	6 m ²
– universal hall (for physical training, rhythmic and choreography with inventory premise)		144 m ² +6
– checkroom for girls and boys (12–13 places)		18 m ² ×2
– shower rooms with lavatory		7 m ² ×2 (two shower cabins, 1 lavatory and 1 wash sink)
– recreation	2.0	
– cloakroom	0.2	
– toilets for girls and boys	0.2	
– universal premises for extended day groups	2.4	
2. Premises for school of II–III level (5–12 years):		
<i>Study classrooms for general subjects for 5-12 years pupils:</i>		
– classroom of Ukrainian language and literature	2.4	1 classroom per 5 classes
– classroom of Russian language and	2.2	

literature		
– classroom of foreign language (on 12–13 seats)	2.4	on 50% of classes
– classroom of history and social science	2.4	1 classroom per 8 classes
– classroom of geography	2.4	1 classroom per 15 classes
– classroom of math	2.4	1 classroom per 8 classes
– laboratories for group of same classrooms	–	16 m ² per 1 group
– classroom of information and computer science (with laboratory for engineering repair)	6.0	on 1 workplace near the PC (laboratory room – 9 m ²)
<i>Laboratories of natural sciences:</i>		
– of physics and astronomy	2.8	1 laboratory per 8 classes
– of chemistry	2.8	1 laboratory per 15 classes
– of biology	2.8	1 laboratory per 15 classes
– laboratories of chemistry, physics, biology and astronomy	0.75	16 m ² per each premise
<i>Premises for physical training and health-improving work:</i>		
– physical training halls and gyms	12 m×24 m 9 m×18 m	
– checkrooms with shower rooms and toilets for girls and boys		(21 m ² + 7 m ²) x 2
– inventory premises		16 m ² and 33 m ²
<i>Premises for primary pre-prescription training:</i>		
– classroom of pre-prescription training including laboratory assistant room and room for equipment storage		6 m ² + 6 m ² + 6 m ²
<i>Shooting gallery with 25 meters fire distance:</i>		
– zone for shooting		180 m ²
– training room		24 m ²
– cloakroom		9 m ²
– instructor's room		6 m ²
– rooms for equipment storage and cleaning		6 m ² + 9 m ²
– toilet		4 m ²
<i>General school premises for collective off-hour activity and rest:</i>		
– stage hall		36 m ²
– inventory room for pop equipment		12 m ²
– artistic checkroom		12 m ² ×12 m ²
– projection booth		24 m ²
– broadcasting center, director's room, room for apparatus repair		21 m ² (12 m ² + 9 m ²)
– room for psycho-physiological		6 m ² for 25 % teaching staff

relaxation		
– disco-hall with inventory premise		108 m ² + 6 m ²
<i>Premises of working education and occupational orientation for pupils of 5-9 years:</i>		
– workshop of metal and wood working with premises for theoretical training and drawing		9 m ² ×2
– cloakroom		
– instrument rooms of masters		18 m ² ×2
– storage premises for raw and wares		18 m ² ×2
– cutting room		18 m ²
– workshop (classroom of service) with fabric processing and cookery including inventory room and cloakroom		90 m ² + 54 m ² +9 m ² +12 m ²
<i>Administrative and economical premises:</i>		
– director’s office		32 m ²
– office of deputy director for educational work		12 m ² , 2 workplaces
– office of deputy director for pedagogic work		12 m ² , 2 workplaces
– office of deputy director for economical work		9 m ²
– methodical room – teaching room with cloakroom		8 m ² per workplace; 0.25 m ² per 1 place
– psychologist room		12 m ²
– chancellery		16 m ²
– lecture hall for students of special and higher teaching and medical educational establishments with cloakroom		2.5 m ² per place
– library		267 m ² per 34 thousand storage units
– dinning hall with seats for 33% of general number of pupils in school		0.85 m ² per 1 place
– cafeteria with seats for 10% of general number of pupils in school		0.85 m ² per 1 place
– washroom near the canteen		24 m ² (1 wash sink per 20 places and 1 drinking fountain per 100 pupils)
– buffet table and buffet storeroom		16+10
<i>Medical block:</i>		
– doctor’s consulting room with waiting room		18 m ² + 6 m ² , one wall not less than 5 m
– medical treatment room and room for preventive vaccination		10 m ² + 8 m ²

– physiotherapeutic room		18 m ²
– dentist’s consulting room		15 m ²
– logopedist’s consulting room		18 m ² , training with group of 6–8 children
<i>Public facilities (toilets):</i>		
– for personnel (for females and males separately on each floor)		each 6 m ²
– room of female personal hygiene		3 m ² joint with female toilets

Quantity of pupils, educational premises, laboratories and gyms is calculated taking into account quantity of training hours per one session and their employment for not less than 75% from total school hours.

Walls of educational establishment must be smooth and provide wet cleaning.

Floor of premises of the general educational establishments must be wooden or covered with heat supported linoleum, without cracks. Floor of toilets and washrooms must be covered with ceramic or mosaic flat tiles. Cement and marble materials for flooring are prohibited in any premises.

Classrooms (study premises) for 1st-4th year pupils must be located on the ground floor in separate block isolated from another age pupils.

If there is classroom educational system in school, these classrooms must be located within one-two floors and transferring from one classroom to another should not take more than 2 minutes. Classrooms for subjects, which are studied the most frequently are located on ground floor for 5-9 years pupils, second floor – for 10-12 years pupils. Optimal classroom quantity depending on school capacity is 2-4 classrooms per each subject.

Educational premises are not through-pass, isolated from premises which may be potential sources of noise and strange smell (workshops, gyms, assembly hall, nutrition unit etc.).

Premises for working education (workshops for wood processing and workshops for metal processing, combined workshops for wood and metal processing, service room etc.) must be isolated from other premises and located in separate blocks on ground floor of schoolhouse, or in separate buildings with cloakroom and toilet. Training and manufacture workshops are equipped for 10th-12th year pupils for labour education and occupational orientation. For this purpose their training is also held at school-to-school field industrial complex and training workshops of industrial and agricultural enterprises.

Gymnasium is located on ground floor. Its size must be sufficient to provide optimal realization of the physical training programs and organization of off-hour sport competitions.

Entrance to the gymnasium must be through-pass or directly from checkroom, or through separate corridor. Storeroom for sport equipment must be connected to the gymnasium by doors or open space with 2m × 2.2 m size. This premise floor is at the same level with gymnasium floor. Gymnasium or storeroom should also have an additional exit, leading out of the building. Gymnasium height must be not less than 6 meters.

Assembly hall must be located on the first floor. It is not recommended to use

assembly hall as gymnasium.

Production canteen premises are projected taking into account peculiarities of technological equipment location. Stoves working on solid fuel may be used only in rural schools with pupil quantity not more than 80. Kitchens in schools must be designed with equipment for meal processing both from raw and half-finished products.

Dinning hall area is calculated not less than 0.85 m^2 per one pupil. Maximum capacity of dinning halls is 350–490 seats. Separate exit from production canteen premises to the backyard should be in place.

Dinning halls are equipped with tables for 4–6–10 seats and chairs or stools. Distance between tables and window (door) for dispensation of food and dirty dishes reception must be 150–200 cm, between row of tables – 100–150 cm, between tables and wall – 40–60 cm. Tables must be covered with corresponding to hygienic requirements materials, easily washed, be resistant to influence of hot water and disinfectants. Wash sinks are equipped accounting for 1 wash sink per 20 seats, hand drying apparatus – 1 per 40 seats.

Premises for trainings of extended day for pupils of general educational establishments are provided for 20% of total number of pupils of 1st–4th year and to 10% of total number of pupils of 5th–9th year.

Width of *recreation premises* is not less than 2.8 meters if there is one-side location of classrooms. Recreation premises area is calculated for each floor and is not less than 2.0 m^2 per one pupil. During construction or reconstruction of general educational establishments recreation premises of hall type are prior.

Medical block must be located on ground floor and include following premises: doctor's consulting room with area not less than 18 m^2 and 5 meters length (for examination of pupils visual and hearing acuity), dentist's consulting room with area not less than 15 m^2 , equipped with exhaust ventilation, medical treatment room with $10 + 8 \text{ m}^2$ area and room for psycho-physiological relaxation with area not less than 18 m^2 .

Cloakrooms are located on ground floors of educational establishments, section equipment for each class is obligatory. Double lobbies with three doors must be projected in vestibules for provision of reliable heat isolation of inside premises.

Presence of independent entrances into the school for pupils of 1st–4th, 5th–7th and 8th–9th years must be provided if block development system is used. In any other cases not less than 2 exits are equipped for permanent exploitation.

Floor stairs must have natural lighting. Footstep height must be 15 cm, its width – 30–35 cm, pitch of staircase – not more than 30° . Horizontal fence of stairs is not allowed. Stairs fence height must be 1.5 m with 0.8 meter high hand-rails. Width of stairs flight must be 1.8 meters.

The following scheme is used to draw up *results of hygienic assessment of land parcel, building, educational premise (classroom) and pupils stay in schoolhouse* into the protocol:

Passport data of educational establishment

Long title of educational establishment, its address, project capacity, quantity of actually studying pupils, classes, classrooms, sessions, presence of extended day groups in this schoolhouse, options, elements of collective and section activity.

Sanitary inspection data of land parcel and building of educational establishment (schoolhouse)

Land parcel location in map of town and neighbourhood includes such characteristics: type of location (inside the residential area, adjacent to some residential areas, on passages between residential areas, etc), service radius, availability and safe removal of children to their way to educational establishment (presence of motorways, crossroads), distance between schoolhouse building and surrounding objects, fence of land parcel, percentage of green area, relative density and type of green plantations (orchard, conifer trees etc.).

Functional zoning of land parcel includes: presence and area of separate zones and peculiarities of their location, number of approach ways, area, equipment and sanitary state of separate zones (training, training and labour, training and research, physical training and sport, economical, residential zones and rest zone).

Sanitary and technical infrastructure of land parcel takes into account: water-supply (local, central, presence of taps for watering in economical, sport, training and research zones), peculiarities of liquid and solid waste disposal, presence of artificial illumination of these zones and paths to building, covering of paths to building and other elements of land parcel.

Building of educational establishment (schoolhouse) includes: type of site development (compact, block (block-section), pavilion), building location concerning other elements of land parcel, peculiarities for saving microclimate and isolation gaps, light climate, presence and distance to shading objects (houses, trees etc.).

Sanitary inspection of a building: number of floors, types of premises (training, training-methodical, administrative and residential) and their interposition, location of separate rooms (classrooms of chemistry, physics, biology), peculiarities of situation and equipment of assembly hall and gymnasium, block for labour training, number of entrances into the school and their connection with cloakroom and canteen.

Sanitary inspection of training premise (classroom): plan-scheme of training premise (classroom) (fig. 39.2), area of training premise (total and per one pupil), volume of training premise (total and per one pupil), actual air cube, distance from first and last school desk to blackboard, distance from walls to tables and distance between rows, characteristics of natural lighting and artificial illumination (lighting coefficient, depth coefficient, orientation of windows, degree of incidence and aperture angles, evenness and sufficiency of lighting, level of artificial illumination at workplaces, type and order of lighting fixture), characteristics of ventilation (aeration coefficient, rate of air exchange, CO₂ concentration in the air), peculiarities of microclimate (average air temperature, horizontal and vertical temperature difference, daily temperature difference, relative air humidity and air movement), determination of school desk or school furniture correspondence to body length of pupils.

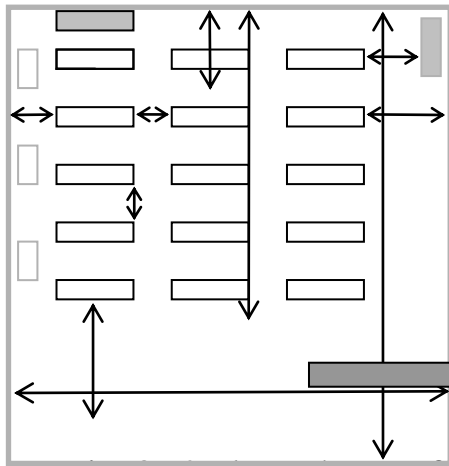


Fig. 39.2 Plan-scheme of training premise (classroom)

Explanation:

- | | |
|--|---|
| 1 – length of classroom; | 6 – distance between rows; |
| 2 – width of classroom; | 7 – distance from school desk to doors; |
| 3 – distance from first school desk to blackboard; | 8 – distance from school desk to internal wall; |
| 4 – distance between school desks; | 9 – distance from last school desk to blackboard; |
| 5 – distance from school desk to external wall; | 10 – distance from last school desk to wall. |

Appendix 2

TRAINING INSTRUCTION

on hygienic assessment of equipment of school premises and school furniture

Equipment of school premises must meet sanitary and hygienic requirements, promote optimal support of teaching and effective teaching and educational off-hour activity. That is why classrooms and laboratories must be equipped with furniture in accordance to normative documents in force.

Furniture is matched taking into account the body length of pupils. It is prohibited to use benches and stools instead of chairs. Physiological working posture for pupils is the working posture when angle of slope of thoracic part of body to cross part equals 145° . The working posture for pupils is also inadmissible if distance from school desk surface to pupil eyes is less than 30 cm.

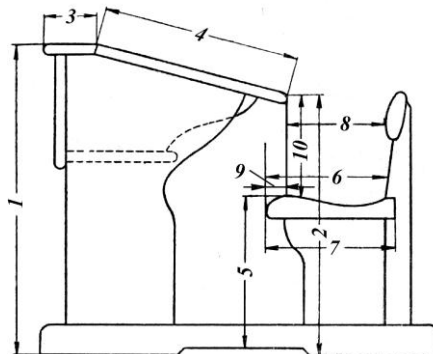


Fig. 39.3 Main sizes of school desk

(1 – height of the front edge of the desk; 2 – height of the back edge of the desk; 3 –

width of the desk slope; 4 – width of the folding part of the desk; 5 – height of the seat; 6 – depth of the seat; 7 – width of the seat; 8 – distance of the back of the seat; 9 – distance of the seat; 10 – differentia)

Main sizes of school furniture during carrying out its hygienic assessment are the following (fig. 39.3):

- *height of the back edge of the desk* is a distance from back edge of the school desk to the floor;
- *height of the seat* is a distance from front edge of the seat to the floor and must correspond to length of crus with foot plus 1.5-2 cm for heel height. This provides low extremities flexion in hip and knee articulations at right angles and adequate bedding of foot on floor or support;
- *distance of the seat* is a distance from front edge of the seat to projection of back edge of school desk slope on seat plane in horizontal plane. The distance of the seat may be *zero* if edges of school desk and seat are in one vertical line; *positive* – if edge of the seat does not reach vertical line down from back edge of the school desk and *negative* if down vertical line is on the seat plane. During educational activity in working posture being seating (writing, reading etc.) the optimal is negative 3-5 cm distance of the seat, during educational activity being standing (answering teacher's questions) the optimal is positive distance of the seat (fig.39.4);

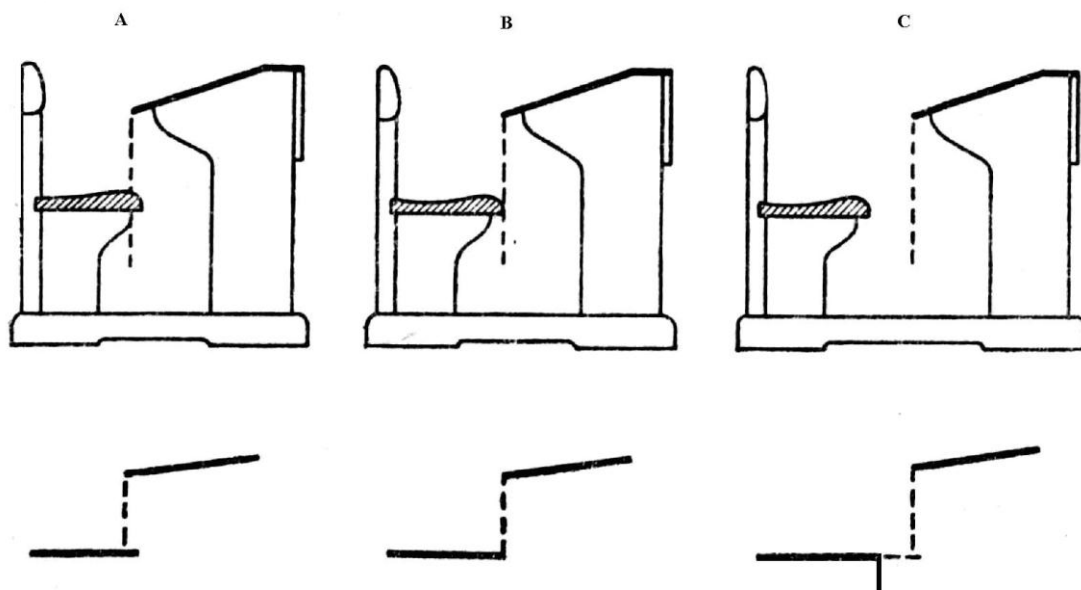


Fig. 39.4 Different variants of distance of the seat
(A – negative; B – zero; C – positive)

- *distance of the back of the seat* is a distance from back edge of folding part of the school desk to the back of the seat. This distance must exceed front-back size of the pupil thorax on width of child palm;
- *differentia* is a distance from back edge of folding part of the school desk to seat plane in vertical plane. Differentia must be equal a distance from the seat to elbow of down arm plus 5–6 cm and provide free location of arms on the school desk. If differentia is decreased too much the pupil bends forward greatly and supports on table which leads to pressure of chest and abdominal organs, ptosis of right shoulder and

development of left-sided scoliosis. If differentia is increased this leads to elevation of right shoulder and development of right-sided scoliosis (fig. 39.5);

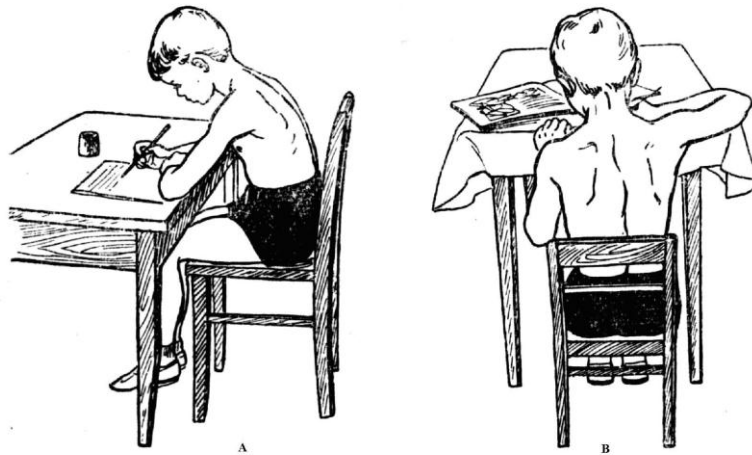


Fig. 39.5 Posture of a body if differentia size is low (a) and high (b)

- *depth of the seat* is a front-back size of the seat and equals from $\frac{2}{3}$ to $\frac{3}{4}$ of hip length;
- *height of the seat* reaches lumbar spine and provides thoracic spine support on this height;
- *angle of slope of the folding part of the school desk* must equal to 15° and allows the pupils to hold a book or copy-book on optimal distance (30-35 cm) from eyes under the biggest angle while head slope of the smallest, this provides permanent accommodation and prevents the myopia development;
- *relief of the seat* must be correspondent to relief of hip and buttocks, little slope to back. It allows the pupils not to slide forward during main educational activity being seating.

Six special sizes of school furniture were worked out (SSRandN 5.5.2.008–01, State Standards of Ukraine 5994–93, 11015–93, 11016–93) for provision of pupils with school furniture corresponding to their body length and based on the received results range them to certain age group: #1 for pupils of 100–115 cm body length; #2 – of pupils with 116–130 cm body length; #3 – for pupils of 131–145 cm body length; #4 – for pupils of 146–160 cm body length; #5 – for pupils of 161–175 cm body length; #6 – for pupils above 176 cm body length.

Sizes of *main construction elements of school furniture* and peculiarities of their measurement are represented in the table 3.

Table 3

Sizes of main construction elements of school furniture

<i>Number of school desk</i>	<i>Height group, cm</i>	<i>Height of the back edge of the school desk above the floor, mm</i>	<i>Height of the seat above the floor, mm</i>
1	up to 115	460	260

2	116–130	520	300
3	131–145	580	340
4	146–160	640	380
5	161–175	700	420
6	above 176	760	460

There are 2-3 sizes of school furniture of certain number in each classroom (laboratory). Nowadays the transforming furniture is preferred. Correct position of children at school desks (tables) may be provide only if children with disparity of not more than 2 years are studying in one premise.

Data concerning *peculiarities of the furniture distribution for schoolchildren of different age* are represented in table 4.

Table 4

Peculiarities of the furniture distribution for schoolchildren of different age

<i>Height group, cm</i>	<i>Group of furniture and marking colour</i>	<i>Class</i>						
		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
up to 115	1 – orange	+						
116–130	2 – violet	+	+	+				
131–145	3 – yellow		+	+	+	+	+	
146–160	4 – red				+	+	+	+
161–175	5 – green							+
above 176	6 – blue							

Furniture in *rectangular classrooms* is located such way that distance between external wall and first row of school desks equals 0.6–0.7 m (in brick buildings this distance may be 0.5 m), between rows of double school desks (tables) – not less than 0.6 m, between third row of school desks (tables) and internal wall or wardrobes near the wall – not less than 0.7 m, between first school desk (table) and demonstration table – not less than 0.8 m. Distance from front wall with blackboard to first school desks must be equal not less than 2.4–2.6 m, from last school desks to back wall – not less than 0.65 m (if back wall is external – not less than 1.0 m), from last school desks

to wardrobes standing along back edge of the wall – not less than 0.8 m, from demonstration table to blackboard – not less than 1.0 m, between teacher table and first school desks of pupils – not less than 0.5 m. The longest distance from last seat to blackboard equals 9 m, height of lower edge of the blackboard above the floor for first year pupils must be 0.7–0.8 m, for 2-4 years pupils – 0.75–0.8 m, for 5-12 years pupils – 0.8–0.9 m.

The distance from blackboard to first school desks must be increased by not less than 3 meters in *transversal or square classrooms* with 4 rows school desks location. This provides the angle of review up to 35°. Distance from first row of school desks to external wall must be 0.8–1.0 m, between rows of school desks (tables) – 0.6 m, from last school desks to wardrobes standing along internal wall – 0.9–1.0 m.

Pupils with decreased visual acuity must seat on first school desks of first row from wall with windows. Pupils with decreased hearing acuity seat on first and second school desks of side rows. Pupils who are ill frequently and for long periods of time seat in third (near internal wall) row of school desks.

For prevention of bearing failure the pupils must be reseated from first row to third twice a year and vice versa. Correspondence of furniture number to the pupil body length is not disturbed in any case and visual and hearing acuity have been taken into account.

School furniture must be marked. *Marking of school furniture* means 2 cm wide strip or 2.5 cm diameter circle on both sides of school desk, table and chair. School furniture of first height group is marked with orange, second – violet, third – yellow, fourth – red, fifth – green, sixth – blue colour.

Except colour marking, number marking is used on internal wall of a school desk as a fraction $\frac{2(\text{group of school desk, chair})}{115-130(\text{body length of pupils})}$ to increase effective control of correct selection of furniture of certain group.

School furniture is located in classroom such way that smaller school desks are closer to the blackboard, bigger ones – farther from the blackboard.

Colour measuring vertical tape is hung on the classroom wall (door) with following marking: orange strip is 115 cm distance from the floor, violet one – from 115 to 130 cm distance, yellow one – from 130 to 145 cm distance, red – from 145 to 160 cm distance, green one – from 160 to 175 cm distance, blue one – above 175cm distance. This colour measuring tape is necessary for determination of number of furniture to each pupil in that classroom

Workplaces in *school workshops* must provide correct working posture of pupils and correspond to safety requirements in full.

That is why there are 13-15 workplaces equipped with engineering tools in workshops. Engineering tools location of 75.5; 78.0 and 80.5 cm height is specified in workshops for woodworking; of 87 and 95 cm height from the floor to vices equipped with protective screens – in workshops for metalworking.

Each workplace has corbel seat or 40-42 cm height stool with 35×35 cm and 40×40 cm seat size. Supports (5 supports for each size) with 55×75 cm size and 5, 10 and 15 cm height must present in workshops for selection of corresponding furniture.

Engineering tools are located either 45° angularly or in three rows at right angle to wall with windows *in workshops for woodworking*. Distance between engineering tools in front-back direction must be equal not less than 0.8 m, between rows – not less than 1.2 m (fig. 39.6).

Engineering tools must be located so, that the light strikes on workplace from the front or right in *workshops for metalworking*. Distance between rows equals 1.0 m, distance from internal wall to engineering tools – not less than 0.8 m. It is the best to locate the same engineering tools in staggered rows. Distance between vices must be not less than 1.0 m.

In workshops for 10-12 years old pupils *instruments of special size # 1* must be used, for 13-15 years old pupils – *instruments of special size # 2*, for above 15 years old pupils – *instruments for adults*.

Maximum lading weight for elevation by 11-12 years old pupils is up to 4 kg, 13-14 years old pupils – up to 5 kg, 15 years old pupils: for boys – 12 kg, for girls – 6.0 kg, 16 years old – 14 and 7 kg, 17 years old – 16 and 8 kg correspondently.

Sanitary inspection of correct selection and arrangement of furniture in training premises includes analysis of presence of not less than 2-3 different number of furniture in each classroom and adequacy of their arrangement to each other, characteristics of a distance between the school desk rows, between furniture and side, front and back walls of premise, studying of provision conditions to the correct working posture and bearing, measurement of main sizes of school furniture etc.

Appendix 3

TRAINING INSTURCTION

on production of universal schooldesk-auxanometer (Nikitin-Flerov ruler)

Table with sizes of main elements of furniture, wooden or metal stick with not less than 100 cm length and tape-line is necessary for production of *universal schooldesk-auxanometer* (Nikitin-Flerov ruler).

Length corresponding to standard height of table (school desk) top and distance from seat to floor for different numbers of furniture is marked on one side of ruler using for determination of furniture number. Back side of ruler is used for determination of the school desk number is divided on six 15 cm points.

Ruler, prepared according to mentioned above procedure, is hung on blackboard, wall or door such way that its first point is on 115 cm distance from the floor, i.e. ruler end is located on 100 cm distance from the floor. Then determination of school desks number or school furniture corresponding to body length of each pupil is carried out.

6. Literature

6.1. Principal:

6.1.1. Загальна гігієна. Пропедевтика гігієни / Є.Г.Гончарук, Ю.І.Кундієв, В.Г.Бардов та ін./ За ред. Є.Г.Гончарука. — К.: Вища шк., 1995. — С. 512—530.

6.1.2. Общая гигиена. Пропедевтика гигиены / Е.И.Гончарук, Ю.И.Кундиев, В.Г.Бардов и др. — К.: Вища шк., 2000. — С. 604—624.

6.1.3. Даценко І.І., Габович Р.Д. Профілактична медицина. Загальна гігієна з основами екології. — К.: Здоров'я, 1999. — С. 590—605.

6.1.4. Даценко І.І., Габович Р.Д. Профілактична медицина. Загальна гігієна з основами екології. — К.: Здоров'я, 2004. — С. 543—555.

6.1.5. Габович Р.Д., Шахбазян Г.Х., Познанский С.С. Гигиена. — К.: Вища школа. 1983. — С. 265—275.

6.1.6. Загальна гігієна. Посібник до практичних занять / І.І.Даценко, О.Б.Денисюк, С.Л.Долошицький та ін. / За ред. І.І.Даценко. — Львів, 1992. — С. 131—140.

6.1.7. Загальна гігієна. Посібник до практичних занять / І.І.Даценко, О.Б.Денисюк, С.Л.Долошицький та ін. / За ред. І.І.Даценко. — Львів: Світ, 2001. — С. 187—207.

6.1.8. Пивоваров Ю.П., Гоева О.Э., Величко А.А. Руководство к лабораторным занятиям по гигиене. — М.: Медицина, 1983. — С. 210—222.

6.2. Additional:

6.2.1. Гигиена детей и подростков / Под ред. В.Н.Кардашенко. — М.: Медицина, 1988. — С. 304—438.

6.2.2. Руководство к лабораторным занятиям по гигиене детей и подростков / В.И.Берзинь и др. — К.: Вища шк., 1989. — С. 186—216, 246—277.

6.2.3. Минх А.А. Методы гигиенических исследований. — М., Медицина, 1971. — С. 529—537.

6.2.4. Бардов В.Г., Сергета І.В. Загальна гігієна та екологія людини: навчальний посібник для студентів стоматологічних факультетів. — Вінниця: НОВА КНИГА, 2002. — С. 164—173.

6.2.5. Гігієна дітей і підлітків / За ред. В.І.Берзіня. — К., Здоров'я, 1998. — С. 69—78.

6.2.6. Сергета І.В, Бардов В.Г. Організація вільного часу та здоров'я школярів. — Вінниця: РВВ ВАТ "Віноблдрукарня", 1997. — 292 с.

6.2.7. Державні санітарні правила і норми по устаткуванню, утриманню загальноосвітніх навчальних закладів та організації навчально-виховного процесу. ДСанПіН 5.5.2.008–01. — К., 2001. — 54 с.

6.2.8. Гігієна та екологія людини: навчальний посібник до практичних занять / За ред. В.Я. Уманського. — Донецьк: „НОРД Комп'ютер”, 2004, - С. 143-173.

NEW REFERENCES

1. Hygiene and ecology: textbook for students of higher medical educational establishments / under the editorship of corresponding member of NAMS of Ukraine, prof. Bardov V.G. – Vinnytsia: Nova Knyha, 2009. – 688 p.

2. Hygiene and ecology / V.A. Korobchanskiy, M.P. Vorontsov, A.A. Musulbas. – Kharkov, 2006. – 207 p.

3. Medicine of emergency situations: textbook for students of higher medical institutions / V.V. Chaplyk, P.V. Oliynyk, S.T. Omelchuk, V.V. Humenyuk. – Vinnytsia: Nova Knyha, 2012. – 344 p.

4. General nutrition: Study guide for the 4th accreditation level Medical School Students / edited by S.T. Omelchuk, O.V. Kuzminska. – Kyiv, 2016. – 146 p.

5. Гигиена и экология: учебник для студентов высших медицинских учебных заведений. – Винница: НОВА КНИГА, 2008ю – 720 с.

7. Equipment required for the lesson

Training project of general school (situational and general layouts of land plot, plans of floors, façades, slit of school premise, plan of school).

School desk or its model, universal schooldesk-auxanometer, tape-line.

Students' self-training situational tasks for hygienic assessment of school, school class, school furniture.