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USSR

INSTRUCTIONS FOR PLANNING BUILDINGS FOR SCIENTIFIC RESEARCH INSTITUTIONS SN 495-77

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16. Abstract (Limit: 200 words)

This report contains instructions drafted by GIPRONII [All-Union State Institute for the Planning of Scientific Research Institutes and Laboratories] for designing buildings for scientific research institutes. Included is information on structural design, water supply and sewage, heating and electrical equipment.

17. Document Analysis a. Descriptors

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Moscow INSTRUKTSIYA PO PROYEKTIROVANIYU ZDANIY NAUCHNO-ISSLEDOVATEL'SKIKH UCHREZHDENIY SN 495-77 in Russian 1978 signed to press 1 Jan 78, pp 1-57

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[Text] The Instructions for Planning Buildings for Scientific Research Institutions SN 495-77 were drafted by GIPRONII [All-Union State Institute for the Planning of Scientific Research Institutes and Laboratories] of the USSR Academy of Sciences.

State Committee of USSR Council of Ministers on Construction Affairs (USSR Gosstroy)	Construction Norms	SN 495-77
	Instructions for planning buildings for scientific research institutions	--

1. GENERAL REGULATIONS

1.1. The requirements of these Instructions should be fulfilled when planning new and renovated buildings for scientific institutions with academic and sectorial specialization (henceforth to be called NII).

The requirements of these Instructions do not extend to the planning of buildings for computation centers, observatories, elementary particle accelerators, simulators, vivariums, autoclaves, laboratories for radioactive substances (for class I and II work), particularly pure substances, virological and pathogenic microorganisms, and artificial climate stations.

1.2. Categories of production facilities (processes) with explosion, fire-explosion and fire hazards in laboratory, production and warehouse facilities of NII of natural and technical sciences should be adopted in accordance with special lists drawn up and approved by the ministries and departments.

2. MASTER PLANS

2.1. When locating buildings for NII, the requirements of the chapter of the SNiP [Construction Norms and Regulations] on planning the layout and building development of cities, settlements and rural population centers must be adhered to; the master plans for NII for natural and technical sciences must be designed in accordance with the chapter of SNiP on designing master plans for industrial enterprises.

Entered by the USSR Academy of Sciences	Approved by the Decree of the State Committee of the USSR Council of Ministers on Construction Affairs of 13 June 1977, No 71	Deadline for putting into operation 1 January 1978

2.2. The density of building up the site of NII for natural and technical sciences should be at least 25 percent, and of NII for social sciences--at least 30 percent. When the building density is determined, the areas of sections of test fields, proving grounds, sanitation-protection and other protective zones are not taken into account.

2.3. When designing the master plans for NII, provision should be made for areas for parking motor vehicles, motor scooters, motorcycles and bicycles, in accordance with the chapter of SNiP on designing the layout and building development of cities, settlements and rural population centers.

2.4. Sites should be provided for gymnastic exercises, estimating 1 square meter per staff associate of the NII.

3. VOLUME-PLANNING AND STRUCTURAL DESIGNS

3.1. When drafting volume-planning and structural designs for buildings for NII, the requirements of the chapter of SNiP on planning public buildings and structures must be observed, and when planning laboratory and production buildings and facilities for NII of natural and technical sciences--the chapter of SNiP on planning production buildings for industrial enterprises.

3.2. Laboratory and production buildings for NII of natural and technical sciences should be in fireproof grade II.

The distances from the doors of the facilities to the outside exit or to the stairwell, as well as the area of the floor between the fireproof walls of buildings for NII (with the exception of separate production buildings) should be adopted in accordance with the chapter of SNiP on planning public buildings and structures.

3.3. In buildings for NII that are 5 stories and more in height, as well as when there is a difference in the levels of the floor of the entrance hall and the floor of the upper story (other than the engineering floor) of 13.2 meters and more, passenger elevators should be provided.

In laboratory and production buildings for NII of natural and technical sciences that are 2 and more stories high, freight elevators should be provided. The lifting capacity of the elevators should be determined by calculation. Unloading areas measuring 2.7 X 2.7 meters should be provided at the freight elevators on each floor.

3.4. Enclosures for recesses designed to house engineering lines should be made of noncumbustible materials. The recesses should be separated by floors with reinforced concrete diaphragms at least 8 cm thick; at the same time, the layer of concrete from the lower edge to the center of gravity of the extended reinforcement should be at least 30 mm. Convenient access from the corridor should be provided for engineering lines located in recesses.

3.5. Outside exits should be provided from facilities with production processes of category C located on basement and foundation floors. It is permissible to use general stairwells for the exit from these facilities, with specification that outside exits be separated from the rest of the stairwell by dead-end noncombustible enclosing structures with at least a 1-hour fireproof limit.

3.6. In laboratory buildings for NII of natural and technical sciences, rubbish chutes must be provided, estimating 1 rubbish chute per 100 meters of length of the building.

Storerooms for janitorial supplies, 3 m^2 in area, must be provided on each floor of buildings for NII.

3.7. The total area of NII per staff associate must not exceed that indicated in Appendix 1.

Laboratory facilities

3.8. The area for the facilities of laboratories for NII of natural and technical sciences should be adopted in accordance with Table 1.

Table 1.

Facilities	Area per laboratory associate, in m^2
Chemical, physics, biological laboratories, facilities for work with radioactive substances, chemical and industrial preparatory and washing facilities	12
Microanalytical and analytical weighing facilities	6

Note: The area of facilities for other laboratories should be chosen in accordance with the industrial requirements and specifications of the equipment located in them.

The area of the work facilities (laboratories) for theoretical work should be adopted by estimating 4 m^2 per associate, and when the work places are equipped with two desks--6 m^2.

3.9. Laboratory facilities are not permitted to be on basement floors.

3.10. Special facilities (compartments) should be provided in laboratory buildings to store the operating stock of flammable liquids and chemicals.

3.11. Ceiling plates in laboratory facilities with production processes of categories A, B and F should have a flat lower surface. Ribbed plates and suspended ceilings are not permitted in these facilities.

3.12. Entrances to stairwells and corridors from facilities with production processes of categories A, B and F are required to have double-door lock chambers. The enclosing structures of the double-door lock chambers should be made of noncombustible materials with a fireproof limit of at least 0.75 hours. The doors to the lock chambers from the facilities with production processes of categories A and B should be specified to be self-closing, fitting tightly when shut, and with a fireproof limit of 0.6 hours, and from other facilities--made of non-fireproof materials, not glass.

The doors of laboratory facilities with production (processes) of category C are permitted to be made of non-fireproof materials, not glass.

3.13. In buildings for laboratories of NII of natural and technical sciences, the minimum width of the corridors should be 2 meters, and of the doors--1 meter.

Scientific Information Facilities

3.14. The number of conference halls, halls for meetings of scientific councils, auditoriums, linguaphone booths and the number of seats in them should be adopted in accordance with Table 2.

3.15. The area of the conference halls, not counting the area of the platform, should be determined by estimating 0.7 m^2, and when the seats are equipped with desks--0.8 m^2 per seat. The depth of the platform in halls with up to 350 seats should be 5 meters, from 350 to 500-7 meters, and over 500--9 meters.

The area of the hall for meetings of the scientific council and of the auditorium should be determined by estimating 0.8 m^2 per seat when the hall and the auditorium are equipped with chairs, and 2 m^2--when they are equipped with chairs and tables.

An additional area of 2 m^2 should be provided to place projection equipment in the halls and auditoriums.

The area of the linguaphone booths should be determined in accordance with the chapter of SNiP on planning institutions of higher education.

3.16. The conference halls should be provided with: a set of equipment for movies (when there are 200 seats and more in the hall), in accordance with the chapter of SNiP on planning public buildings and structures, with the estimated parameters and conditions for screen visibility being adopted in accordance with the chapter of SNiP on planning clubs;

Preparation facilities with an area of 10 m^2,
Audio equipment (when there are 200 seats and more in the hall)--an area of 18 m^2,
Presidium room, with up to 350 seats in the hall--an area of 12 m^2, and over 500--24 m^2;
Stock storeroom, with under 500 seats in the hall--12 m^2, and over 500--24 m^2.

Table 2.

Помещения (6)	(1) Количество помещений / (2) Количество мест в одном помещении / (3) НИИ естественных и технических наук					(4) при штатной численности сотрудников / (5) НИИ общественных наук		
	300	600	1000	2000	3500	300	600	1000
(7) Конференц-залы	$\frac{1}{200}$	$\frac{1}{350}$	$\frac{1}{500}$	$\frac{1}{650}$ и $\frac{1}{150}$	$\frac{1}{800}$, $\frac{1}{200}$ и $\frac{1}{150}$	$\frac{1}{200}$	$\frac{1}{350}$	$\frac{1}{500}$
(8) Залы заседаний ученого совета	—	—	—	$\frac{1}{60}$	$\frac{2}{60}$	$\frac{1}{60}$	$\frac{1}{60}$	$\frac{1}{60}$
(9) Аудитории	$\frac{1}{30}$	$\frac{3}{30}$	$\frac{4}{30}$	$\frac{7}{30}$	$\frac{10}{30}$	$\frac{1}{30}$	$\frac{2}{30}$ и $\frac{2}{15}$	$\frac{2}{30}$ и $\frac{3}{15}$
(10) Лингафонные кабинеты	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{1}{12}$ и $\frac{1}{6}$	$\frac{1}{12}$ и $\frac{3}{6}$	$\frac{2}{12}$ и $\frac{3}{6}$	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{1}{12}$ и $\frac{1}{6}$

Key:
1. Number of facilities
2. Number of seats in one facility
3. NII of natural and technical sciences
4. With staff number of associates
5. NII of social sciences
6. Facilities
7. Conference halls
8. Scientific council meeting halls
9. Auditoriums
10. Linguaphone booths

Note. Auditoriums and linguaphone booths are provided in NII with a graduate study program. NII that do not have graduate study are permitted to provide one auditorium seating 30 when the staff numbers up to 600 persons, and 2—over 600 persons.

3.17. The area of the lobby for the conference hall should be determined by estimating 0.6 m^2 per seat in the hall.

3.18. Conference halls in laboratory buildings for NII for natural and technical sciences should be arranged in accordance with Table 3.

Table 3.

Number of seats in conference hall	Floors
Up to 300	1-5
Over 300 and up to 600	1-3
Over 600	1-2

3.19. Suspended ceilings and the facing for the walls of conference halls should be specified to be made from almost noninflammable materials; the frames of the suspended ceilings should be metal or wood, thoroughly impregnated with fireproofing compounds.

3.20. In the scientific library provision must be made for a stackroom, reading rooms, an anteroom with a loan desk and readers' catalogue, a desk for issuing books and a display case of new books, rooms for book acquisitions and processing and an office for the head librarian. For libraries with a collection of 50-200,000 units in the stacks, facilities 18 m^2 in area should be provided for binding and restoring work.

3.21. The stacks for the collection and number of seats in the reading rooms of the libraries should be approved in accordance with Table 4.

Table 4.

NII	Collection storage, in thousand units				With number of staff associates
	Number of seats in reading rooms				
	300	600	1000	2000	3500
Natural and technical sciences	35/40	55/60	80/90	135/160	200/245
Social sciences	45/60	70/90	100/130	--	--

3.22 The area of the stacks equipped with single-tier permanent racks should be determined from estimating:

For books--2.5 m^2 per 1000 units for storage,
For journals--2.7 m^2 per 1000 units of storage.

The area of the reading room, entrance hall, rooms for book acquisition and processing and office of the head librarian should be adopted in accordance with Table 5.

Table 5.

Facilities	Measuring indicator	Area, in m^2
Reading room	Per seat	3
	Per 1000 units storage in open access collection	5
	Per librarian on duty	4
Entrance hall	Per seat in reading room	0.45
Rooms for book acquisition and processing, office of head librarian	Per library associate	6

3.23. The stacks should be equipped with metal shelves, and the reading rooms--with single-chair reading tables, and booths for individual work, 3 m^2 in area. For the open access collections, located right in the reading rooms, wooden shelves are permitted.

3.24. The closed stacks should be separated from the other facilities by fireproof walls and ceilings with the fireproof limit at least 1 hour.

3.25. The composition and area of the facilities in the scientific-technical information division and the scientific archives should be as follows:

Rooms for reference and bibliographical description of information documents and rooms for graphic layout of scientific works--6 m^2 per associate in the division;

Facilities for readers--3 m^2 per seat;

Facilities for reference card indexes--0.04 m^2 per 1000 catalogue card indexes;

Repositories for documents--2.6 m^2 per 1000 units of document storage;

Repositories for microfilms--0.9 m^2 per 100 boxes (measuring 360 X 360 X X 45 mm and with a capacity of 200 meters of film) of rolled microfilms;

Facilities for photo-copying and electrography--in accordance with the technological requirements and specifications of the equipment.

The total area of the facilities for the scientific-technical information division and scientific archives per staff associate of the NII should be no more than 0.2 m^2.

Auxiliary Facilities

3.26. The sanitation-everyday facilities and facilities for public catering enterprises, public health centers, NII administrative offices, design bureaus and social organizations should be planned in accordance with the chapter of SNiP on planning auxiliary buildings and facilities for industrial enterprises. In this case:

The sanitation-everyday facilities should be provided for those working in the laboratories and the production facilities of the NII of natural and technical sciences; for the rest of those working at the NII of natural and technical sciences and NII of social sciences, only toilets, wash rooms and rooms for women's personal hygiene should be provided;

The amount of sanitation equipment in the lavatories should be estimated as 1 toilet bowl and 1 urinal per 50 men and 1 toilet bowl per 30 women;

The public health centers should be provided for NII of natural and technical sciences; for NII of social sciences, a medical room 12 m^2 in area should be provided;

Storage of street clothing should be provided in general coatrooms for street clothing, on hangers.

3.27. The number of places in the coatrooms for street clothing should be adopted depending on the size of the staff of associates with a coefficient of 1.1, the area--from estimating 0.08 m^2 per place.

3.28. The area of the entrance hall (not counting the coatrooms) should be determined by estimating 0.2 m^2 per worker in the building, but be at least 18 m^2.

To locate kiosks selling newspapers, books and medications in the entrance hall, an additional area of 4 m^2 for each kiosk should be provided.

3.29. The area of the administrative work rooms of NII should be adopted by estimating 4 m^2 per associate.

The total area of the administrative facilities per administrative associate (allowing for offices and reception rooms) should be, in NII of natural and technical sciences, not over 9.5 m^2, and in NII of social sciences--not over 11.5 m^2

3.30. The number of men and number of women on the staffs of associates of NII should be adopted as equal, or in accordance with the planning assignment.

3.31. Emergency showers should be provided in the laboratory buildings of NII of natural and technical sciences on each floor. The distance from the laboratory facilities to the emergency shower should be not more than 30 m.

3.32. Facilities for service personnel (janitors, elevator operators, guards, etc.) in each NII building should be accepted with an area of 0.75 m^2 per person on a shift; the area of the facilities for the service personnel should be at least 8 m^2.

4. WATER SUPPLY AND SEWAGE

4.1. For NII buildings, systems for interior water pipelines and sewage should be planned in accordance with the chapter of SNiP on planning the interior water pipelines and sewage for buildings in this division.

4.2. In NII buildings over two stories, for groups of laboratory facilities located on a single vertical, the water supply and sewage standpipes should be laid out in the engineering line recesses.

The supply pipelines should be laid open, sloping toward the standpipes. For departments located in the center of the facilities, the pipelines should be laid in basement conduits or in the toothing of the floor, and at these sections of the pipelines there should be no cut-off devices and screw connections.

The main and transfer pipelines should be laid out in basement ducts, technical basements or on the technical floors.

4.3. The consolidated flow rates of water and sewage should be determined in accordance with Table 6.

Table 6.

Basic facilities of building	Water [illegible] sewage flow rates per 1 [illegible] of total area	
	liters/hr	liters/day
Chemical and biological laboratories	15	90
Physics laboratories	8	50
Experimental workshops	7	35
Facilities for NII of social sciences, scientific-information and auxiliary facilities	1.2	5

Water Supply

4.4. In NII buildings a unified interior water pipeline (facilities-drinking water, production and fire-prevention). The water should be of potable quality.

The requirements for quality of water for industrial equipment and its temperature specifications should be established by the industrial assignment.

4.5. Centralized systems of recycled water supply and repeated use of water should be provided for the production water supply of a group of NII buildings.

4.6. The water flow rate for laboratory faucets, q_0, in liters/sec, should be accepted according to Table 7, and the probability of their operation--determined according to the formula

$$P = \frac{0{,}0045}{q_0},$$

where q_0 is the flow rate of water taken for a laboratory faucet, established at the estimated section of the system, the flow rate per second of which is the greatest.

Table 7.

Водоразборные приборы (1)	(2) Расход воды q_0, л/с: (3) общий (холодной и горячей)	(2) Расход воды q_0, л/с: (4) холодной или горячей	(5) Свободный напор перед прибором, м вод. ст.	(6) Минимальные диаметры условного прохода трубопроводов, мм: (7) подводящего	(6) Минимальные диаметры условного прохода трубопроводов, мм: (8) отводящего
(9) Ниппель на колонке для холодильника	—	0,017	3	8	32
(10) Смеситель лабораторной раковины	0,14	0,1	3	10	40
(11) Водоразборный кран лабораторной раковины	—	0,1	3	10	40
(12) Колонка водоструйного насоса	—	0,15	25	10	40
(13) Технологическое оборудование	По технической характеристике оборудования или технологической части проекта (14)			По расчету (15)	

Key:

1. Water faucets
2. Flow rate of water, q_0, in liters/sec
3. Total (cold and hot)
4. Cold or hot
5. Free pressure head before faucet, in m, water column
6. Minimum diameters of conditional passage of pipelines, in mm
7. Input
8. Output
9. Nipple at refrigerator column
10. Laboratory sink mixer
11. Laboratory sink faucet
12. Jet pump column
13. Industrial equipment
14. According to technical specifications of equipment or industrial part of plan
15. According to estimate

4.7. When determining the maximum hourly flow rate of water, the coefficient of use of the water faucets should be taken as equal to 0.28.

4.8. The water flow rate for the interior fire-extinguishing of buildings for NII of natural and technical sciences should be accepted by calculating the simultaneous operation of two jets and the flow rate of water per jet as 2.5 liters/sec., and for buildings for NII of social sciences--as for administrative buildings.

4.9. For emergency showers, a tank with a capacity of 200 liters, filled with water from the water pipeline system through the ball cock should be provided.

A group of emergency showers placed along a single vertical should be served by a single tank, installed under the ceiling of the upper floor or on the technical floor.

The flow rate of the water to fill the tank for the emergency shower is not counted in the estimated flow rate of the water. The shower should turn on automatically when the stall is entered.

Sewage

4.10. In construction regions not provided with a sewage system, the installation of a set of local purification structures must be provided for the buildings and structures of NII.

4.11. The composition and concentration of the contaminants in the production sewage should be determined according to the technological data.

For preliminary estimates, the active reaction (pH) and biochemical oxygen requirement (BPK) in the sewage from laboratory instruments should be taken as:

a) In organic chemistry laboratories, pH=6.5-8.5 and BPK_{20}--100 mg/l;
b) In inorganic chemistry laboratories, pH=6.5-8.5 and BPK_{20}--100 mg/l;
c) In biological laboratories, pH=6.5-8.5 and BPK_{20}--200-500 mg/l.

4.12. The estimated discharge of sewage should be accepted in accordance with the estimated flow rate of the water consumption, with the discharge of the sewage from the emergency showers not being counted.

4.13. The installation of an additional siphon must be provided at each output line from the laboratory facilities, regardless of the presence of a hydraulic seal at the instruments.

Additional siphons should be selected in consideration of the possibility of the effect on them of acids, alkalies and solvents.

4.14. The outgo of sewage into the exterior sewage system is not permitted from drains installed in facilities for service discharge storehouses to store and bottle chemicals and highly inflammable and fuel liquids. An area must be provided to collect the product poured off and the water from washing the floor.

The sewage discharges are removed from the areas in the chemical storehouses after their neutralization by a hand pump into the sewage system, and from the areas in the warehouses for highly inflammable and fuel liquids--into metal tanks.

Hot Water Supply

4.15. Centralized hot water supply systems should be designed for buildings for NII in accordance with the chapter of SNiP on planning hot water supply and these Instructions.

4.16. The estimated hourly consumption of heat needed to heat the water should be adopted according to the larger of the two rates determined for the operating conditions of the hot water supply system in the course of the work day and for 45 minutes after the work day has ended. In the first case the heat consumption for the heating should be considered as 30 percent of the hourly consumption of hot water for the washrooms, 10 percent of the hourly consumption of water for the shower systems and 100 percent of the hourly consumption of water for industrial needs; in the second case, the heat consumption for the heating--100 percent of the hourly consumption of hot water for the washrooms and shower systems and 50 percent of the hourly consumption of water for industrial needs.

4.17. The hot-water consumption by the laboratory instruments should be accepted according to Table 7. The laboratory sinks and washers, washrooms and shower stalls should be equipped with individual mixers.

5. HEAT SUPPLY, HEATING AND VENTILATION

5.1. The heat supply, heating and ventilation for NII buildings should be designed in accordance with the chapter of SNiP on planning heating, ventilation and air conditioning and the chapter of SNiP on planning heating systems and by this section.

5.2. The heat supply for a group of buildings and structures for NII should as a rule be provided from a central heating point.

5.3. The feed of heat for the heat supply of the heating, ventilation and hot water supply systems should as a rule be provided along separate pipelines from the heating center.

The pipelines should be specified to be laid in a common duct.

5.4. Open laying of the pipelines of the heating systems in the buildings should be specified.

Covered laying of the pipelines is permissible in facilities for which special industrial requirements are imposed (microbiological isolation rooms, facilities for particularly pure operations, etc.).

5.5. Air-heating and air curtains in the main entrances to NII buildings for natural and technical sciences should be provided if the estimated temperature of the outside air of the coldest five-day period in the construction region (estimated parameters B) is -15°C and below and there are over 200 persons working in the building.

5.6. The combined heat consumption for heating, ventilation and hot water supply of the buildings should be determined according to Table 8.

Table 8.

Facilities Помещения	(1) Расход тепла				
	на отопление (2)		на вентиляцию (2)		на горячее водоснабжение, ккал/ч на 1 м² общей площади (6)
	(4) ккал/м³·ч·°C	(5) ккал/ч·°C на 1 м² общей площади	(4) ккал/м³·ч·°C	(5) ккал/ч·°C на 1 м² общей площади	
(7) Химические и биологические лаборатории	0,38	1,8	2,8	13,5	120
(8) Физические лаборатории	0,36	1,8	1,6	8,8	80
(9) Помещения научно-информационного назначения и вспомогательные	0,37	1,9	0,75	2,75	[60
(10) Экспериментальные мастерские	0,34	3,6	1	11	65
(11) Помещения НИИ общественных наук	0,35	2,2	0,18	0,5	6

Key:

1. Heat consumption
2. For heating
3. For ventilation
4. Kcal/m^3.hr·°C
5. Kcal/m^3·hr·°C per m^2 of total area
6. For hot water supply, kcal/hr per m^2 of total area
7. Chemical and biological laboratories
8. Physics laboratories
9. Scientific information and auxiliary facilities
10. Experimental workshops
11. Facilities for NII of social sciences

5.7. Heating and ventilation for facilities of NII of natural and technical sciences should be planned in consideration of the requirements of Table 9.

Table 9.

Facilities	Estimated air temperature in facilities, in °C, in cold period of year	Heating Requirements	Ventilation Requirements
	A. Laboratory facilities		
1. Chemical laboratories	20	Water, with radiators or headers	In accordance with note 2 for this table
2. Physics laboratories	20	Same	Same
3. Biological laboratories	20	"	"
Biological and microbiological isolation rooms	According to industrial assignment		According to industrial assignment Purification of inflowing air in bacteriological filters Air velocity in working area not over 0.05 m/s Volume of air removed--80% of volume of inflow air
4. Facilities for work with radioactive substances	20	Water, with built-in heating elements or registers made of smooth pipe	According to industrial assignment, allowing for instructions of note 3 for this table Inflow and exhaust systems, separate for this group of facilities Air ducts of exhaust system may be laid up to exhaust ventilator in general engineering recesses, with transit--through upper floors
5. Chemical and industrial preparation facilities	18	Water with radiators or headers	Removal of air through exhaust hood. Inflow to upper area
6. Washing	18	Same	Same

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	Facilities	Estimated air temperature in facilities, in °C, in cold period of year	Heating Requirements	Ventilation Requirements
7.	Microanalytic and analytic weighing	20	Air	According to industrial assignment, year-round air conditioning, when: $t = 20 \pm 0.5$°C $\phi = 55 \pm 3$%
8.	Facilities for special work:			
	a) spectral and mass spectrometric	20	Water with built-in heating elements or with registers made of smooth pipes	Special requirements not imposed
	b) electronic microscopes	20	Water with built-in heating elements or with registers made of smooth pipes in microscope booth. In rest of facilities--radiators	Volume of air removed--90% of inflow air volume
	c) X-ray spectographic, X-ray apparatus, crystal optical	20	Water with registers made of smooth pipes	Removal of 1/3 volume of air from lower area, 2/3 from upper area
	d) calometric	18	Same, with radiators	According to industrial assignment In case equipment is installed in separate facilities, automatic air temperature maintenance specified in accordance with certificate for given equipment

Facilities	Estimated air temperature in facilities, in °C, in cold period of year	Heating Requirements	Ventilation Requirements
e) average cooking, autoclave--sterilization, installation	18	Water with radiators	Hood over autoclave and plate, volume of air being removed and inflowing according to estimate for removing excess heat
f) rocking and thermoconstant	According to industrial assignment		
g) mercury	16-18	Water with registers made of smooth pipes accessible for cleaning	In exhaust hood the velocity of the air in the gates with all the valves open should be at least 0.5 m/s with usual work and 1 m/s when the mercury is heated
	B. Experimental Workshops		
9. Glassblowing and quartz-blowing workshops	16	Water with radiators or headers	Calorific intensity should not exceed 100-125 kcal/(m^3·hr). Temperature in facilities not to exceed 28°C Increase in air temperature in work area ($t_{p.з}$) above temperature of incoming air ($t_{пр}$) not over 3-5°C. Temperature of outgoing air (t_{yx}) to be determined from expression: a) with general exchange ventilation $\frac{t_{p.з} - t_{np}}{t_{yx} - t_{np}} = 0.33$; b) with local vents $\frac{t_{p.з} - t_{np}}{t_{yx} - t_{np}} = 0.15$

Facilities	Estimated Air temperature in facilities, in °C, in cold period of year	Heating Requirements	Ventilation Requirements
			Feed of inflow air into work area Air velocity in work area--not over 0.2 m/s Removal of air in glass-blowing facilities--from upper area, in quartz-blowing--from local vents and from upper area (10-15%).
10. Copper-welding division	16	Water with radiators or headers	Air removed from welding stations by local vents of equal suction and single-draft air exchange of facilities Air removed from upper area, inflow--to work area
11. Thermal division	16	Same	Air removed by local vents from furnaces and tanks for hardening and additionally from upper area for balance of heat surplus, inflow--to work area
12. Galvanizing division	16	"	Air removed by side vents of tanks and single-draft air exchange Air removed from upper area, inflow--evenly to upper area
13. Painting facilities	16	Water with radiators	Air removed by local vents of industrial equipment and additional single-draft air exchange Air removed from upper area, inflow--to upper area Emergency ventilation (exhaust) in amount of 8 volumes of facilities in 1 hr,, not compensated by inflow

Facilities	Estimated air temperature in facilities, in °C, in cold period of year	Heating Requirements	Ventilation Requirements
14. Repair of control and measuring instruments	18	Water with radiators or headers	Air removed by local vents of radio-assembly sections and additionally from upper area for balance of heat surplus, inflow--to upper area
15. Grinding division	18	Same, with radiators	Air removed by local vents of grindstones; purification of removed air in cyclone with inverse taper, inflow--to upper area
16. Polishing section in grinding-polishing division	18	Same	Air removed by local vents of grinding-polishing tool; purification of removed air in FYaR type filter, inflow--to upper area
C. Warehouses			
17. Warehouses for storing chemicals and inflammable liquids, storage compartments for operations stock of chemicals and inflammable liquids:			Air exchange by estimate, but no less than ratio depending on maximum permissible concentration of substances in work area: over 10 mg/m^3--8 times in 1 hr; from 10 to 0.5 mg/m^3--10 times in 1 hr; less than 0.5--12 times in 1 hr
a) facilities for storage in large and small packaging and packaging facilities if there is exhaust hood	According to industrial assignment		Air removed through hood for exhaust, from upper area in amount of single air exchange in 1 hr, inflow--for balance: in work area--90%, in corridor--10%

Facilities	Estimated air temperature in facilities, in °C, in cold period of year	Heating Requirements	Ventilation Requirements
b) same, if no exhaust hood	Same		Air removed from upper and lower areas, inflow for balance: to work area--90%, to corridor--10%
c) Facilities for storing extremely toxic poisons	"		Air removed through hood for exhaust, from upper area in amount of two-stage air exchange in 1 hr, in consideration of requirements of industrial assignment, inflow--for balance: to work area--90%, to corridor--10%
18. Warehouses for equipment, warehouses for cylinders	"		Air removed--natural, not compensated by inflow
19. Facilities of buildings of separate warehouses for equipment	According to industrial assignment		Natural ventilation in amount of single air exchange in 1 hr for inflow and exhaust

Notes: 1. The amount of harmful substances, heat and moisture escaping in facilities should be determined in the technological part of the plan.

2. For laboratory facilities equipped with exhaust hoods, the calculation of the exhaust ventilation should be made according to the greatest value of the amount of air removed through the exhaust hoods (depending on the air speed in the estimated opening of the hood), and the amount of air needed to remove excess heat and moisture from the facilities.

3. When planning ventilation systems for the laboratories mentioned in item 4 of this table, in addition there should be fulfillment of the requirement of the Fundamental Sanitation Regulations for Work With Radioactive Substances and Other Sources of Ionizing Radiations, approved by the USSR Ministry of Health by agreement with USSR Gosstroy.

5.8. Additional losses of heat to warm the outside air entering the facilities of chemical laboratories through infiltration should be determined in accordance with Appendix 2.

5.9. For laboratory facilities of NII of natural and technical sciences, balanced ventilation, mechanically induced, should be designed, providing heating, purification and humidification (in the cold period of the year) of the air when necessary.

5.10. When the ventilation is planned, the temperature, relative humidity and air velocity in the facilities of natural and technical scientific laboratories should be adopted just as for production facilities, the work in which is included among the light category, as well as in accordance with industrial requirements.

5.11. In facilities in which work is performed with harmful substances of all classes of hazard or fuel steams and gases are emitted, air recirculation is not permitted.

5.12. The heat emission, Q, in kcal/hr, from the current collectors of the industrial equipment should be determined according to the formula

$$Q = 860\ N\ K,$$

where Q is the established power of the current collectors, in kw;
N is the coefficient, allowing for the degree of charge, use of established power, simultaneity of operation of the current collectors and passage of heat to the facilities, equal to:
for chemical laboratories--0.05;
for physics and other laboratories--0.015;
for machine tools installed in experimental workshops--0.15.

The established power of permanent current collectors of industrial units and the coefficient K for them must be adopted according to the data from the industrial part of the plan.

Heat emission to the facilities from gas Bunsen burners, Q, in kcal/hr, established at laboratory desks, should be determined according to the formula

$$Q = 1000 \cdot 0.6\ n,$$

where 1000--the heat load for the burner, in kcal/hr;
0.6--the coefficient taking into consideration the amount of heat entering the facilities;
n--the number of burners burning simultaneously (for every two associates working in the laboratory facilities, one burner is customary).

Moisture emission from the laboratory Bunsen burner should be accepted as 200 g/hr.

5.13. Opening parts of windows and natural ventilation systems should be provided in laboratory facilities to remove the air from the facilities in nonworking time.

5.14. The amount of air removed through the exhaust hood should be determined in accordance with the velocity of the air in the estimated opening of the hood, in accordance with Table 10.

Table 10

Maximum permissible concentrations of harmful substances in work area, in mg/m^3	Air velocity in estimated opening of hood, in m/sec
Over 10	0.5
from 10 to 0.1	0.7
less than 0.1	1

Notes: 1. The area of the estimated opening must be adopted as 0.2 m^2 per meter of length of exhaust hood.

2. In work involving emission of aerosols and dust from substances of hazard class 1, 2 and 3 into the air, the air velocity in the estimated opening of the exhaust hood should be accepted as 1.2-1.5 m/sec.

3. The coefficient of simultaneity of the work of the exhaust hoods should be accepted as equal to a unit.

5.15. Air flow should be fed directly into the laboratory facilities in the amount of 90 percent of the amount of air removed by local vent systems, and the rest of the air (10%)--into the corridor and the halls; at the same time, a 20-fold exchange of air should be ensured in the halls of buildings that specialize in chemical laboratories, adjacent to the stairwells or the elevator shafts; the volume of the halls should be adopted as estimated for the minimum, and not over 130 m^3.

5.16. In aerodynamic calculation of the balanced ventilation systems of buildings for chemical laboratories, the head of air into the facilities must be taken into account (depending on the floor on which the facilities are located) in accordance with Table 11.

Table 11

Facilities	Amount of head on floors, kgs/m^3				
	1	2	3	4	5
Laboratories	4	3	2	1	0
Rooms for theoretical work	8	7	6	5	4
Corridors and halls	7	6	5	4	3

5.17. It is not permissible to combine the air ducts of local vents of soldering posts with the air ducts of the exhaust ventilation of facilities for a different purpose, with the exception of facilities where the welding of alloys containing lead is done for short periods of time (not more than an hour a day).

5.18. The permissible levels of acoustic pressure and acoust'. levels at permanent work places must be adopted in accordance with GOST [All-Union State Standard] 12.1.003--76.

5.19. At inflow, exhaust and recirculation air ducts serving facilities equipped with automatic fire-extinguishing systems, automatic valves with electric drive, connected with the automatic fire-extinguishing systems, should be provided. The valves should be installed in direct proximity to the facilities served by the air duct.

5.20. For exhaust systems of facilities for laboratories with production processes of categories A, B and F, reserve fans should be provided that turn on automatically when the basic fan stops, as well as a light signal indication of the operation of the fan. Reserve fans do not have to be provided for facilities for laboratories with production processes of categories C, D and E. A light signal indicator of the operation of the fan for the local vent should be provided in the laboratory facilities.

5.21. Plenum ventilation systems, air conditioning and air heating systems serving facilities with production processes of categories A, B and F should be designed separate for the groups of facilities of each of these categories.

The feed of air into auxiliary facilities, as well as facilities with production processes of categories D and E may be provided by plenum ventilation systems and air conditioning systems that serve the facilities of laboratories with production processes of category C; in this case the facilities with the production processes of category C should be provided with a supply of air along a separate air duct (from the ventilation equipment facilities or the static pressure chamber); there should be a flat check valve on this air duct.

5.22. The feed of air into the compartment for the operating stock of highly flammable liquids with production processes of categories A, B and F, located in the building for the laboratories, may be provided from the plenum ventilation systems serving the facilities with production processes of category C, on condition that the compartment with the operating stock of highly flammable liquids is equipped with an automatic fire extinguishing system and automatic fire-retardant valves are installed at the inflow and exhaust air ducts in front of their inputs to the facilities of the compartments, and also that there is an automatic cut-off device for the inflow and exhaust air ducts in case of fire in the compartments.

5.23. Exhaust ventilation systems serving facilities with production processes of categories A, B and F should be designed as separate for each facility.

5.24. The exhaust ventilation system of facilities for laboratories with production processes of category C, equipped with exhaust hoods, including those designed for work with dangerously explosive or flammable substances, should be designed in the following way:

Decentralized from the exhaust hoods with an individual air duct and ventilator for each facility;

Centralized, in which the exhaust air ducts from each separate laboratory facility are combined into a vertical collector tank located outside the building, or a horizontal one located on the technical floor, in the facilities for the exhaust system equipment.

In the centralized exhaust ventilation system there must be provided:

Installation of fire-retardant valves at the branches of the air ducts for the laboratory facilities;

Installation of a reserve fan that turns on automatically when the main one stops, and when the work involves the use of dangerously explosive or dangerously explosive and flammable materials, there must be provided in addition:

Installation of a fan and electric motor in an explosion-proof version;

Automatic control of the concentration of gases in the collector tank and an interlock that ensure the addition of outside air when the concentration of gases or steam in the collector is over 20 percent of the lower limit of ignition (if there is industrial substantiation this device is not provided).

Formation of highly toxic mixtures of steam, gases and aerosols in the collector is not permissible.

5.25. With the decentralized system of exhaust ventilation it is permissible to locate the equipment for the systems serving the laboratory facilities with production processes of category C together with the equipment designed for the ventilation systems for the auxiliary facilities, as well as with the equipment of the exhaust ventilation systems for facilities with production processes of categories D and E. In this case, automatic fire-retardant valves should be installed at the air ducts of the exhaust systems of facilities in which highly flammable and fuel liquids are used.

5.26. For laboratory facilities with production processes of category C, it is permissible to design common inflow collectors. Combining the floor branches of the air ducts or floor collectors is permissible for not over nine floors. In this case, provision must be made to install self-closing flat check valves at each floor branch or floor collector that serves a group of facilities with a total area of not over 300 m^2.

5.27. In laboratory facilities the local vents and the common exchange exhaust may be combined into one exhaust system. The air ducts of the local vents and the common exchange exhaust may be combined within the laboratory facilities or in the facilities with the ventilation equipment.

5.28. In exhaust ventilation systems for laboratories, when an air mixture with chemically active gases is removed, air ducts made from corrosion-resistant materials should be used.

6. GAS SUPPLY

6.1. The gas supply should be designed in accordance with the chapter of SNiP on designing interior devices, exterior networks and structures for gas supply, in consideration of this section. Low-pressure gas should be used for industrial and everyday needs.

6.2. The combined gas flow rate should be determined from the heat loads in accordance with Table 12.

Table 12.

Basic facilities in building	Heat loads per 1 m^2 of total area q', in kcal/hr
Chemical and biological laboratories	50
Physics laboratories	12
Experimental workshops	30

6.3. When determining the maximum hourly flow rate of gas, $Q_{\rho.\iota}$, m^3 (NTP)/ /day, the heat loads and demand factor of the action of the gas instruments, k, given in Table 13, should be used.

6.4. The estimated hourly flow rate of the gas should be determined according to the formula

$$Q_{\rho.\iota} = \frac{qnk}{W}$$

where q --the rated heat load by one user of the same type, in kcal/hr;
n --the number of users of the same type in the building or the estimated section of the pipeline;
W --the calorific value of the gas used, in kcal/m^3 (NTP);
k --the demand factor of the action of the users.

The daily amount of gas Q_{cyr}, in m^3 (NTP)/day, should be determined according to the formula

Table 13

Потребители (1)	(2) Номинальная тепловая нагрузка q, ккал/ч	(3) Значение коэффициента одновременности действия k в зависимости от количества кранов									
		10	50	100	200	300	400	600	750	1000	2000 и более
(4) Однорожковый лабораторный газовый кран (ниппель)	1000	0,5	0,29	0,23	0,18	0,15	0,14	0,13	0,11	0,1	0,08
(5) Паяльная лабораторная горелка	2750	0,8	—	—	—	—	—	—	—	—	—
(6) Стеклодувная горелка типа «Пушка» большая	12500	0,8	—	—	—	—	—	—	—	—	—
(7) То же, «Пушка» малая	6300	0,8	—	—	—	—	—	—	—	—	—
(8) Технологическое оборудование и приборы	(9) По технологической части проекта или по технической характеристике оборудования и приборов										

Key:
1. Users
2. Rated heat load q, in kcal/hr
3. Value of demand coefficient of action k, depending on number of valves
4. Single-prong laboratory gas valve (nipple)
5. Laboratory glass blowpipe
6. Large Pushka type glass-blowing pipe
7. Small Pushka " " " "
8. Industrial equipment and instruments
9. According to industrial part of plan or according to technical specifications of equipment and instruments

$$Q_{сут} = \frac{Q_{р.ч.} T}{1.5}$$

where T--the work time in hours;
1.5--the hourly peaking factor of gas consumption.

7. POWER SUPPLY AND ELECTRICAL EQUIPMENT

7.1. Power supply, power electrical equipment and electric lighting for NII should be designed in accordance with the Rules for Setting Up Electric Installation (PUE), instructions for planning power supply, power and lighting electrical equipment for industrial enterprises, installation of ground and foundation level systems at electrical plants, installation of lightning protection for buildings and structures, the chapter of SNiP on planning artificial lighting and these Instructions.

7.2. According to the degree of reliability of the power supply, the electric receivers of warehouse and utility facilities and electric motors of machine tool and crane equipment are included in the third category, and the rest of the electric receivers--in the second category.

The power supply of the electric motors of fire service pumps and other electric receivers of fire-prevention devices, of protection and fire warning signal systems, elevators, electric motors for emergency ventilation and emergency electric lighting should be provided from different transformers of two-transformer substations or from transformers of two neighboring transformer substations, with two separate lines each with an automatic reserve switching device.

7.3. Direct current with a voltage of 380/220 volts should be used for the power supply of NII.

7.4. The direct current power supply for laboratory facilities should as a rule be provided from local rectifiers, placed in the given laboratory.

The use of nonportable storage batteries (for the entire building) and installation of centralized systems of direct current power supply is permitted when there are special justifications in the planning assignment only for a voltage of 110 and 220 volts.

7.5. A special laboratory network must be provided in NII buildings to power the electric receivers hooked up to the laboratory panels.

7.6. Laboratory panels should be specified for alternating current voltage of 380/220 volts (with substantiation, also for 110 and 220 volts direct current--see paragraph 7.4). Direct current with a voltage of 24, 12 and 6 volts should not be supplied to laboratory panels.

7.7. All the socket outlets on laboratory panels should have a grounding contact.

7.8. When a laboratory power supply system is planned, allowance must be made for the possibility of its replacement if there is a change in the process of performing the scientific research work.

7.9. Wires and cables with aluminum cores should be used, except in cases stipulated in the PUE.

7.10. Systems powering laboratory panels, as well as lighting systems for NII buildings should be protected against overloading.

7.11. The use of capacity, when main laboratory systems are estimated, should be adopted according to the number of distributing centers connected.

When a laboratory power supply distributing system is planned, as a rule not more than three laboratory panels should be combined "into the circuit"; in this case the cross section of the wires should be chosen from the conditions of a full load of one laboratory panel and the selectivity of the shield.

7.12. When the power of the transformers is selected, the use factors of the electric receivers for the laboratory system should be adopted according to Table 14, and the use factors of the other electric receivers--according to Table 15.

The estimated power of the laboratory panels should be adopted according to Table 16.

Table 14

Electric receiver	Use factor	
	alternating current	direct current
Biological laboratories	0.15	0.1
Chemical laboratories	0.2	0.1
Physics laboratories	0.25	0.15

Table 15

Electric receivers	Use factor
Exhaust ventilation systems	0.6
Plenum ventilation systems	0.7
Metal and wood working machine tools, mechanisms	0.2
Welding transformers	0.25
Cranes and hoists	0.15
Resistance furnaces, induction furnaces, valve oscillators, electric motors, pumps	0.7
Lighting:	
for power systems	0.8
for inputs	0.7

Table 16.

Laboratory panels	Estimated power of one laboratory panel, in kw	
	alternating current, 380/220 V	direct current 110 and 220 V
In chemical and biological laboratories:		
exhaust hood panels	3	0.5
laboratory chemical desk panels	4	0.5
wall laboratory panels	2	0.5
In physics laboratories:		
exhaust hood panels	3	0.5
wall laboratory panels	8	1
laboratory physics desk panels	8	1

7.13. The combined indicators of the estimated power of the transformers of a transformer substation should be adopted according to Table 17.

Table 17.

Facilities	Estimated power of transformers, in kva	
	per staff associate	per m^2 of total area
Chemical and biological laboratories	3	0.195
Physics laboratories	3.5	0.21
Working facilities (laboratories) of social science NII	0.8	0.1
Experimental workshops	2.5	0.17

7.14. The laboratory facilities of NII of natural and technical sciences should be included among facilities with heightened danger of injury to people from electric shocks.

7.15. The corridors of the buildings, if no centralized system of dust removal is provided for them, should be provided with socket outlets with a protective contact to connect cleaning machines. The socket outlets should be installed at a distance that ensures the possibility of hooking up the cleaning machines with a feed line 15 meters long.

7.16. A special system should be provided for power for the refrigerators.

7.17. Industrial grounding with a resistance of 10 ohms should be provided for particularly precise measurements in some facilities (according to the assignment for the planning). When there are special requirements for the industrial part of the plan, the resistance of the industrial grounding devices may be reduced to 2-3 ohms. The grounding wires for the industrial grounding for the purpose of ensuring minimum induction should be provided with shields with an outer insulating covering.

The cross section of the grounding wires of the industrial grounding system should be determined by estimate and be at least 25 mm^2, and the cross sections of the branches to the facilities--at least 10 mm^2 for aluminum.

Laboratory panels must be provided with a place to install terminals for industrial grounding, insulated from the housing of the metal panel. The source of the industrial grounding should be at least 15-20 meters from the source of the protective grounding.

7.18. Shielded facilities should as a rule be provided with one input from the power system. The protective grounding (zero adjustment) system of the building must be used to ground the shield.

7.19. To service and repair lamps and electrical equipment, separate facilities must be provided with an area estimated as 10 m^2 for each 1000 lamps, but at least 20 m^2. These facilities must be equipped with work benches for the electrical wiring work, laboratory panels, shelves and washers with hot and cold water.

7.20. The systems for smoke removal and the head of the air, the electrical fire warning signal systems, fire pumps and emergency ventilation should be supplied with electric power from a special electric panel of the fire-fighting devices, which should be colored red. These electrical systems must be laid separately from the other electrical systems for the building.

7.21. Units controlling and distributing inert gases through the laboratory facilities should be equipped with gas analyzers for continuous monitoring of the purity of the gas returned from the laboratory and light and sound signal warnings of a disorder in the hermetic sealing of the gas line.

7.22. Facilities designed for work involving ionizing emissions must be equipped with instruments for radiation monitoring; a lighted signal panel should be installed at the entrance doors of these facilities: "Entry Forbidden," "Entry Permitted." When the level of activity of the ionizing emissions in these facilities is below the established threshold, the radiation monitoring instruments should be in a holding state, which should be signaled by a green light. Exceeding the permissible threshold of activity of the ionizing emissions should be accompanied by switching from the green to a red light and a sound signal in the facilities being monitored and on the radiation monitoring panel. The irradiation chambers should be equipped with a mechanical blocking device, preventing entry into the facilities during work of the source of the irradiation.

7.23. Isotope laboratory facilities should be provided with continuous or periodic monitoring of the radiation level and compulsory monitoring for possible contamination of clothing and the body when the associates leave the facilities.

7.24. Facilities for laboratories with toxic substances should be equipped with gas analyzers and a blocking system. The monitoring and blocking system, when the maximum permissible concentrations are reached, should ensure:

Switching on the emergency ventilation,
Cutting off the toxic gas or liquid at the supply pipeline,
Supplying light and sound signals to the facilities being monitored and to the panels of the person on duty,
Closing the valve at the inflow air duct with the cutting off of the exhaust systems.

7.25. All facilities with production processes of categories A, B and F should be equipped with gas analyzers and a blocking system. The monitoring and blocking system, when the maximum permissible concentrations are reached, should ensure:

Switching on the emergency exhaust ventilation,
Cutting off the gas with cut-off valves at the supply pipeline and supplying light and sound signals.

7.26. NII buildings should be provided with a central control panel of the sanitatary engineering and industrial units, located in the facilities for the control service.

Local exhaust ventilation systems (local vents, chemical exhaust hoods, etc.) should be controlled from the facilities being served, and only the signal of the condition should extend to the control panel. In some cases the control panel may be installed in the facilities for the plenum ventilation systems.

7.27. An interior communications telephone should be installed in the laboratory and office facilities. Tie-lines to city telephones should be installed in the administrative facilities and in the offices of the division chiefs of laboratory heads.

7.28. The director's line should be designed for direct, efficient communications between the NII director and the division chiefs and laboratory heads.

7.29. Secondary electric clocks should be installed in the corridors, entrance halls, reading rooms and production facilities 30 m^2 or more in area.

7.30. The city, local and director's communication systems, as well as those for the electric clocks and radio installation should be combined into a single comprehensive system.

7.31. Open laying of the low-power communications systems should be specified in the production and auxiliary facilities, and in the rest of the facilities--closed (in this case the use of steel pipes is not permitted).

7.32. Radio installation for NII buildings must be designed from the city broadcasting network. It is permissible to design a local broadcast relay exchange if this is specified by the assignment for the planning.

Radio points of the city network should be installed in administrative facilities and in the offices of laboratory heads. The radio points of the local radio broadcast relay exchange should be located in the laboratory facilities and in the offices.

7.33. The facilities mentioned in Appendix 3 should be equipped with automatic fire warning signals. The automatic fire-extinguishing systems should be provided in accordance with Appendix 4.

APPENDIX 1

Total Area of Buildings for NII per Staff Associate

Table 18

Number of Staff Associates	Total Area, in m^2
NII of natural and technical sciences	
300	30
600	29.7
1000	29.3
2000	28.3
3500	26.8
NII of social sciences	
300	20
600	19.4
1000	18.6

APPENDIX 2

Determining Heat Loss in Heating the Exterior Air Entering the Facilities Through Infiltration

The additional heat losses, $Q_{нн}$, in kcal/hr, to heat the outside air entering, through infiltration, chemical laboratories, should be determined according to the formula

$$Q_{нн} = B\bar{Q}\frac{FA}{\sqrt{S}}$$

where Q--the amount of the relative heat losses, accepted according to graphs (Figs. 1-14);

B--the nondimensional coefficient, equal, for buildings up to 6 floors inclusive, to 11.9, and for buildings up to 9 stories, to 12.98;

F--the area of the windows of identical design in facilities, in m^2;

A--the coefficient allowing for heating the air through basic heat losses: for single and double casements, $A = 1$, for the rest of the designs of the window apertures made, $A = 0.8$;

s--the specific characteristics of the resistance to the air penetration of the design adopted for making the window apertures, in $m^2 \cdot hr^2/kg$, determined according to Table 19.

Additional heat losses for heating the exterior air entering the facilities through infiltration should be determined for the working and nonworking time and the greater amount of heat loss be adopted in the calculations.

Table 19.

Designs of fillings of window apertures and type of sealing linings	s, $m^2 \cdot hr^2/kg$
Single or double sash without sealing linings for the panels	0.0014
Same, with the panels sealed with foam rubber	0.022
Same, with the panels sealed with foam polyurethane	0.029
Double sashes without sealing linings for the panels	0.0035
Same, with panels of inner sash sealed with foam rubber	0.029
Same, with the panels sealed with foam polyurethane	0.035
Double sashes with panels sealed for both sashes with foam rubber	0.054
Same, with panels sealed with foam polyurethane	0.066

Notes: 1. The designs for the fillings of the window apertures and the type of sealing lining should be adopted in accordance with the SNiP for construction heat engineering.

2. The values of the specific specifications of resistance to air penetration for the filling of window apertures, s, are adopted in the table for an outside air temperature of $t_H = -30°C$ and the temperature of the air in the facilities, $t_B = 20°C$ ($t_{cp} = -5°C$). For other temperature conditions the table values should be multiplied by the coefficient K, determined according to the formula

$$K = \frac{268}{273 + \frac{t_в + t_н}{2}}.$$

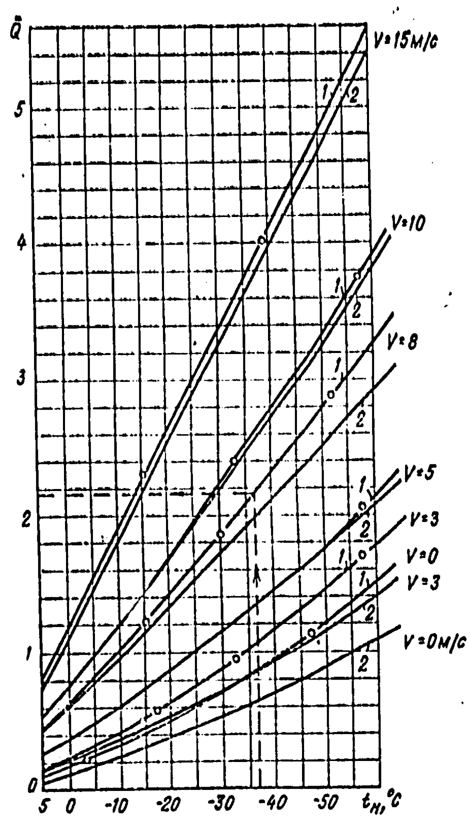

Figure 1. Amount of relative heat losses ($\bar{Q}$) for facilities of the 1st-2d floors of a 6-story building in nonworking time, as well as for facilities with exhaust ventilation fully compensated by the inflow during work time

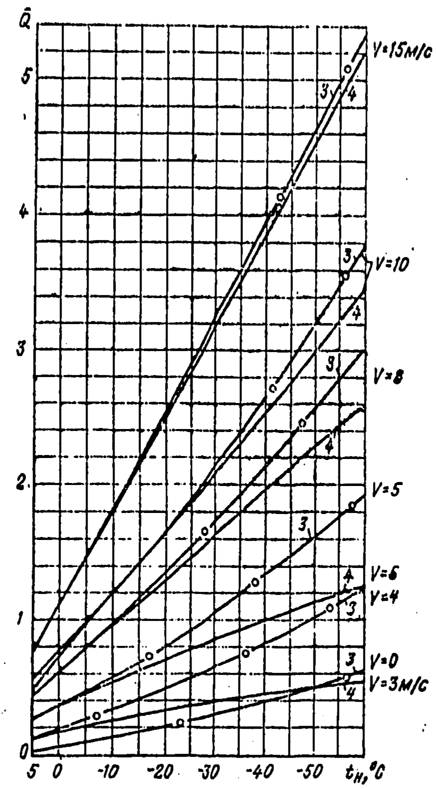

Figure 2. Amount of relative heat losses (Q̄) for facilities of 3d-4th floors of 6-story building in nonworking time, as well as for facilities with exhaust ventilation, fully compensated by inflow during working time

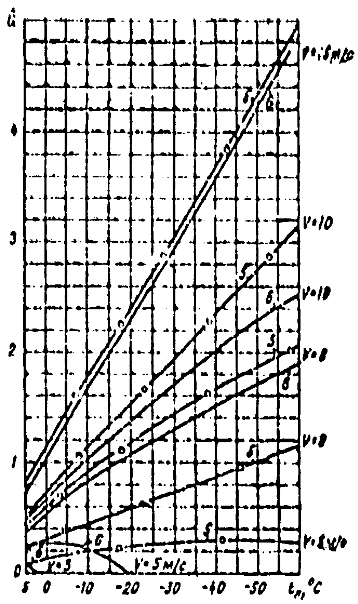

Figure 3. Amount of relative heat losses ($\bar{Q}$) for facilities of 5th-6th floors of 6-story building in nonworking time, as well as for facilities with exhaust ventilation fully compensated by inflow during working time

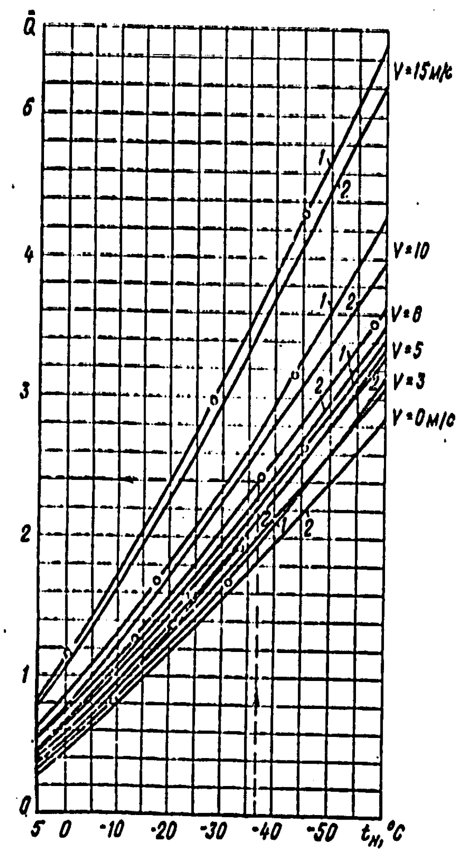

Figure 4. Amount of relative heat losses (Q̄) for facilities of 1st-2d floors of 6-story building with exhaust ventilation not compensated by inflow during working hours

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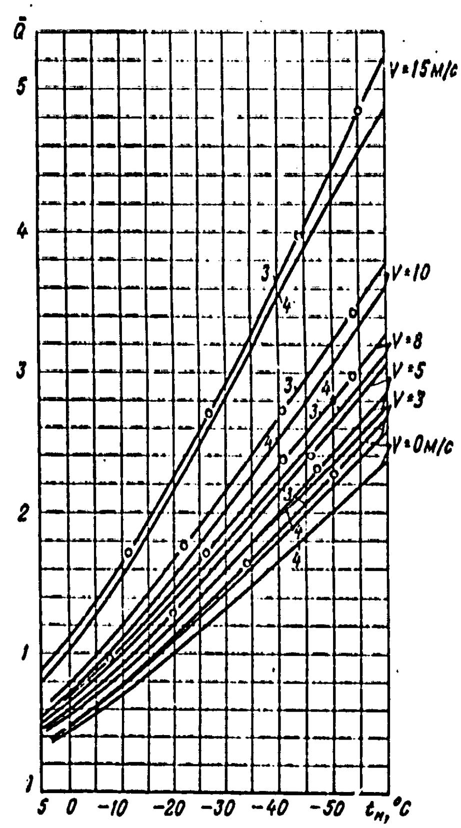

Figure 5. Amount of relative heat losses ($\bar{Q}$) for facilities of 3d-4th floors of 6-story building with exhaust ventilation, not compensated by inflow during working time

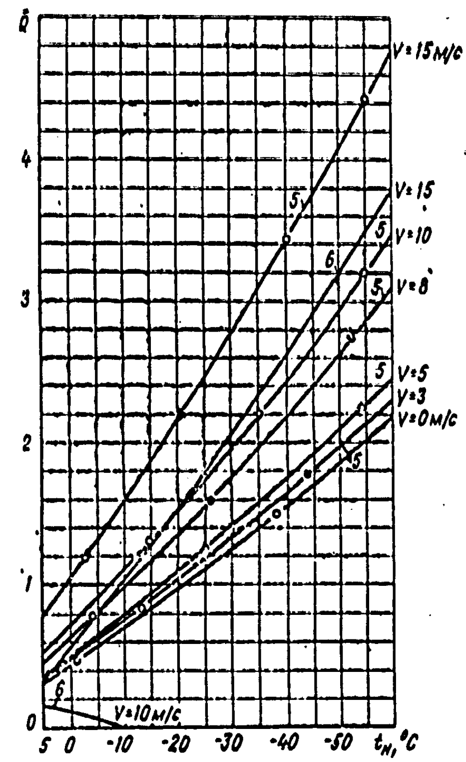

Figure 6. Amount of relative heat losses ($\bar{Q}$) for facilities of 5th-6th floors of 6-story building with exhaust ventilation, not compensated by inflow during working time

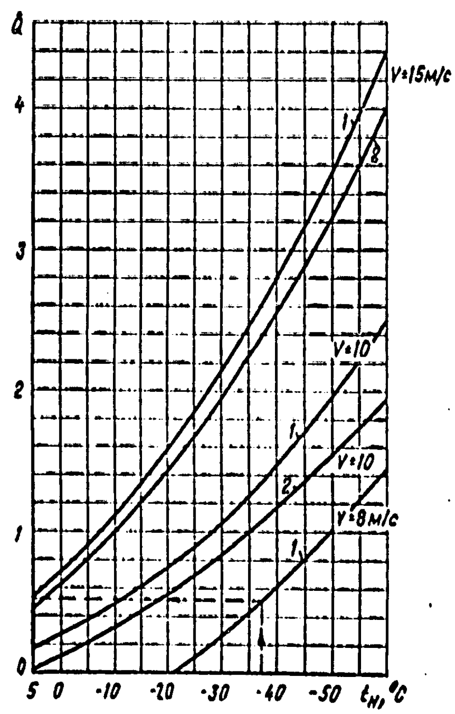

Figure 7. Amount of relative heat losses ($\overline{Q}$) for facilities of 1st-2d floor of 6-story building with excess inflow during working time

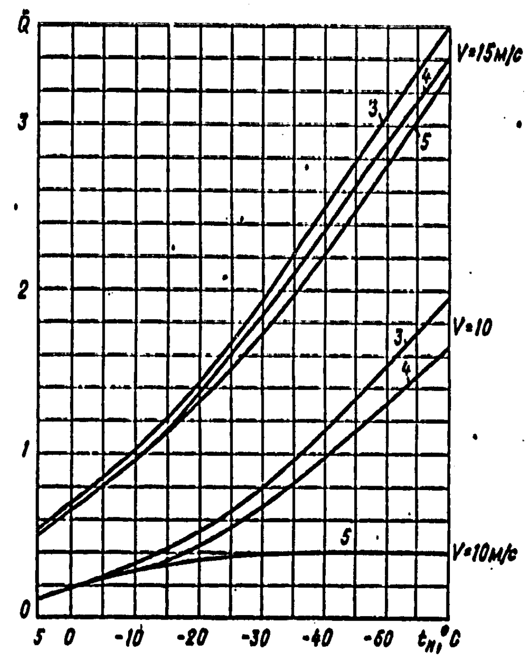

Figure 8. Amount of relative heat losses ($\vec{Q}$) for facilities of 3d-5th floors of 6-story building with excess inflow during working time

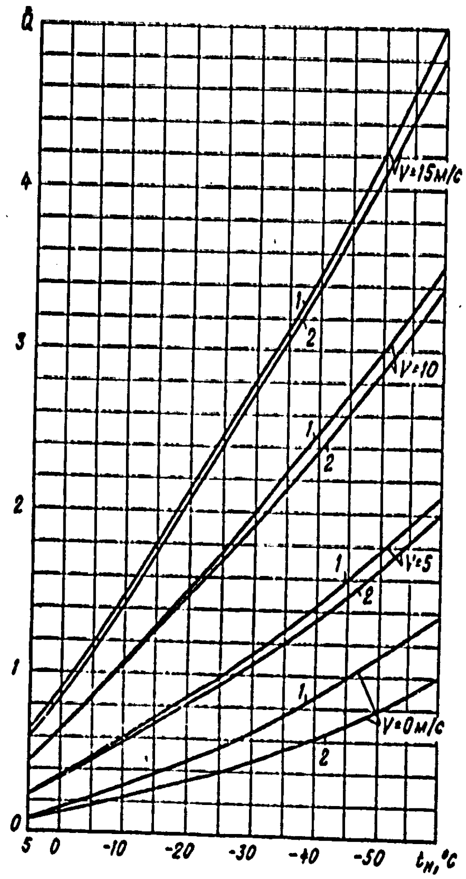

Figure 9. Amount of relative heat losses ($\bar{Q}$) for facilities of 1st-2d floors of 9-story building when ventilation system is switched off

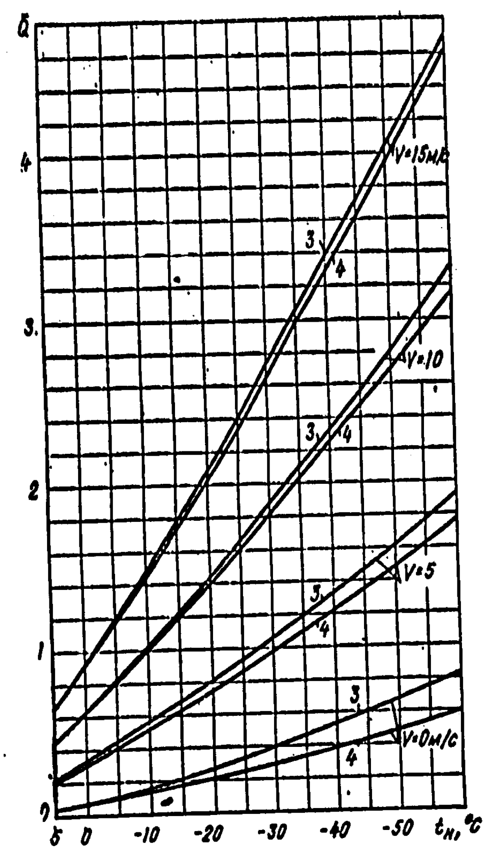

Figure 10. Amount of relative heat losses ($\bar{Q}$) for facilities of 3d-4th floors of 9-story building when ventilation system is switched off

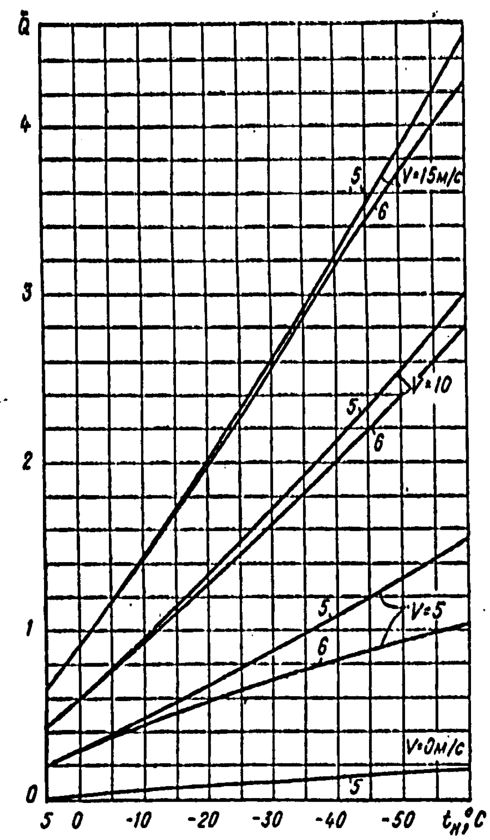

Figure 11. Amount of relative heat losses ($\bar{Q}$) for facilities of 5th-6th floors of 9-story building when ventilation system is switched off.

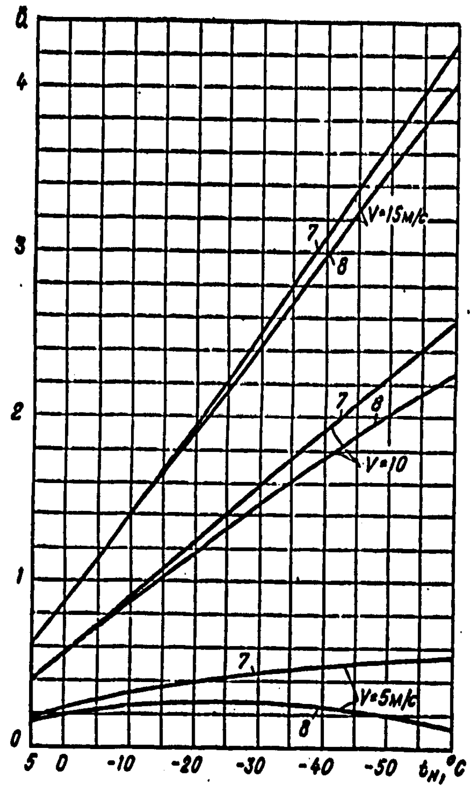

Figure 12. Amount of relative heat losses ($\bar{Q}$) for facilities of 7th-8th floors of 9-story building when ventilation system is switched off

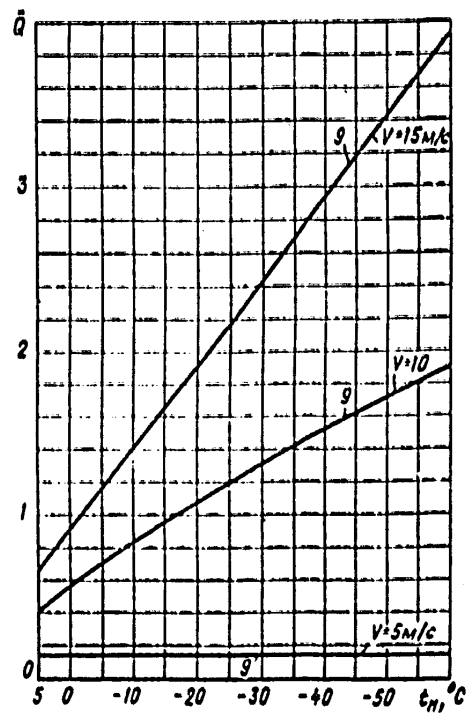

Figure 13. Amount of relative heat losses ($\bar{Q}$) for facilities of 9th floor of 9-story building when ventilation system is switched off

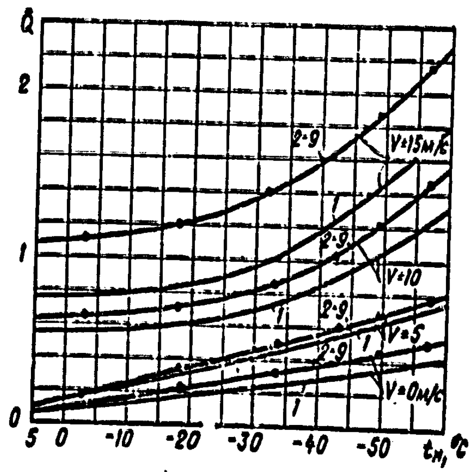

Figure 14. Amount of relative heat losses ($\bar{Q}$) for facilities of 1st-9th floors with excess exhaust, of 9-story building when the ventilation system is operating

APPENDIX 3

List of Facilities To Be Equipped With Automatic Fire Alarms

1. Facilities of laboratories of NII of natural and technical sciences with production processes of categories A, B and C, working facilities (laboratories) of Nii of social sciences, photo laboratories (except developing laboratories), facilities for control and measuring instruments (KIP).

3. Auxiliary facilities--in accordance with the chapter of SNiP on planning auxiliary buildings and facilities for industrial enterprises.

4. Experimental workshops: facilities with production processes of categories A, B and C, facilities for repairing electrical engineering, radio engineering and thermal equipment and instruments.

5. Warehouse facilities: for highly flammable, fuel liquids and chemicals, when the area of the warehouse is less than 500 m^2, for storing cylinders with fuel gases and for storing combustible materials and equipment or materials and equipment in combustible packaging.

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6. Facilities for transformers with oil transformers, compressor and panel facilities and control boards.

Note. If these facilities are to be equipped with safety signal devices, they must be equipped with combined safety-fire signal devices.

APPENDIX 4

List of Buildings and Facilities To Be Equipped With Automatic Fire Extinguishers

1. Warehouses for highly flammable liquids, fuel liquids and fuel chemicals with an area of 500 m^2 and over; facilities (compartments) for storing the operating stock of highly flammable liquids, fuel liquids and chemicals.

2. Facilities (booths, boxes) for testing using highly flammable liquids and fuel liquids.

3. Facilities with special-purpose equipment, instruments and materials; facilities for storing and issuing special-purpose items, accounts, manuscripts and other documentation of particular value.

Table of Correlations Between Certain Units of Physical Measures Subject to Withdrawal and Units of the International System of Units (SI)

Description of measurement	Units: Subject to withdrawal – Description	Units: Subject to withdrawal – Designation	Units: SI – Description	Units: SI – Designation	Correlation of units
Force; load; weight	kilogram-force ton-force gram-force	kgs ts gs	Newton	N	1 kgs ~ 9.8 N ~ 10 N 1 ts ~ $9.8\cdot10^3$ N ~ 10 kN 1 gs ~ $9.8\cdot10^{-3}$ N ~ 10 mN
Linear load Surface load	kilogram-force per meter kilogram-force per square meter	kgs/m kgs/m^2	Newton per meter Newton per square meter	N/m N/m^2	1 kgs/m ~ 10 N/m 1 kgs/m^2 ~ 10 N/m^2
Pressure	kilogram-force per square centimeter millimeter of water column millimeter of mercury column	kgs/cm^2 mm wat. col. mm Hg col.	Pascal	Pa	1 kgs/cm^2 ~ $9.8\cdot10^4$ Pa ~ ~ 10^5 Pa ~ 0.1 MPa 1 mm wat. col ~ 9.8 Pa ~ ~ 10 Pa 1 mm Hg col. ~ 133.3 Pa
Mechanical stress Modulus of elasticity; shear modulus; modulus of cubic compression	kilogram-force per square millimeter kilogram-force per square centimeter	kgs/mm^2 kgs/cm^2	Pascal	Pa	1 kgs/mm^2 ~ $9.8\cdot10^6$ Pa ~ ~ 10^7 Pa ~ 10 MPa 1 kgs/cm^2 ~ $9.8\cdot10^4$ Pa ~ ~ 10^5 Pa ~ 0.1 MPa
Specific heat	calorie per gram-degree Celsius kilocalorie per kilogram--degree Celsius	cal//(g·°C) kcal//(kg·°C)	Joule per kilogram-Kelvin	J/(kg X X K)	1 cal/(g·°C) ~ $4.2\cdot10^3$ J/(kg·K) 1 kcal/(kg·°C) ~ 4.2 kJ/(kg·K)

Description of measurement	Units: Subject to withdrawal — Description	Units: Subject to withdrawal — Designation	Units: SI — Description	Units: SI — Designation	Correlation of units
Heat conductivity	Calories per second per centimeter--degrees Celsius Kilocalories per hour per meter--degrees Celsius	Cal/(s·cm·°C) Kcal/(hr·m·°C)	Watts per meter--Kelvin	w/(m·K)	1 cal/(s·cm·°C) ∼ ∼ 420 w (m·K) 1 kcal/(hr·m·°C) 1.16 w/(m·K)
Heat transfer coefficient;	Calories per second per square centimeter--degrees Celsius Kilocalories per hr per square meter--degrees Celsius	Cal/(c·cm^2 X °C) Kcal/(hr X m^2·°C)	Watts per square meter--Kelvin	w/(m^2 X K)	1 cal (c·cm^2·°C) ∼ 42kw/(m^2·K) 1 kcal/(hr·m^2·°C) ∼ ∼ 1.16 kw/(m^2·K)
Force moment; moment of a couple	Kilogram-force-meter	kgs·m	Newton-meter	N·m	1 kgs·m ∼ 9.8 N·m ∼ ∼ 10 N·m
Work (energy)	Kilogram-force-meter	kgs·m	Joule	J	1 kgs·m ∼ 9.8 J ∼ 10 J
Amount of heat	Calorie Kilocalorie	Cal Kcal	Joule	J	1 cal ∼ 4.2 J 1 kcal ∼ 4.2 kJ
Power	Kilogram-force-meter per second Horse power Calories per second Kilocalories per hr	kgs·m/s h.p. cal/s kcal/hr	Watt	w	1 kgs·m/c ∼ 9.8 w ∼ 10 w 1 h.p. ∼ 735.5 w 1 cal/s ∼ 4.2 w 1 kcal/hr ∼ 1.16 w

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