CONSTRUCTION STANDARDS OF THE KYRGYZ REPUBLIC

System of normative documents in construction

HEATING, VENTILATION AND AIR CONDITIONING AIR

Zhylytuu, yeldetү jana abany konditsiyaloo

Heating, ventilation and air conditioning

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1 Area of application

1.1 These construction standards apply to the design of indoor heating and cooling, heating, ventilation and air conditioning, smoke ventilation systems in buildings under construction, renovation, or major renovation, including multifunctional buildings and buildings of the same functional purpose.

1.2 These construction standards do not apply to heating, ventilation and air conditioning systems of civil defense protective structures; structures designed for work with radioactive substances, sources of ionizing radiation; underground mining facilities and premises where explosives are produced, stored or used; special heating, cooling and dedusting units and devices for technological and electrical equipment; aspiration, pneumatic transport and dust and gas exhaust

2 Regulatory References

These building codes are based on normative references to the following documents:

2.1 **Normative legal acts:**

Law of the Kyrgyz Republic "On Energy Saving";
Law of the Kyrgyz Republic "On Energy Efficiency of Buildings ";
The Law of the Kyrgyz Republic "On Renewable Energy Sources";
Law of the Kyrgyz Republic "On Ensuring Fire Safety".

2.2 **Normative and technical documents:**

CHP 42-01:2020 "Design of gas supply systems"; CHP 31-05:2018 "Industrial buildings";
SNiP 2.01.07-85* Loads and impacts;
SNiP KR 23-01:2013 Building Heat Engineering (Thermal Protection of Buildings); SNiP KR 23-02-00 Building Climatology;
SP KR 23-101:2013 Design of thermal protection of buildings;
MSN 2.04-02-2004 Thermal protection of buildings;
MSN 2.04-03-2005 Protection against noise;
MSN 3.02-04-2004 Multifamily Residential Buildings**;**
MSN 4.02-03-2004 Thermal insulation of equipment and pipelines;
SanPiN 2.2.4.548-96[1)] Hygienic requirements for the microclimate of industrial premises;
GOST 12.1.003-83* System of Occupational Safety Standards. Noise. General safety requirements;
GOST 12.1.005-88* System of Labor Safety Standards. General sanitary and hygienic requirements for working area air;
GOST 12.1.007-76* System of Occupational Safety Standards. Hazardous substances. Classification and general safety requirements;
GOST 15150-69 Machines, devices and other technical products. Versions for different climatic regions. Categories, conditions of operation, storage and transportation in terms of climatic factors of external environment;
GOST 30494-2011 Buildings residential and public. Parameters of microclimate in the premises;

GOST 31937-2011 Buildings and constructions . Rules for inspection and monitoring of technical condition;

NPB 253-98[1)] Smoke protection equipment for buildings and structures. Fans. Test method for fire resistance.

2.3 **Regulatory documents of EEU countries**

GOST 12.2.233-2012 Occupational Safety Standards System. Refrigeration systems with cooling capacity over 3,0 kW. Safety requirements.

GOST 10616-2015 Interstate standard. Radial and axial fans. Dimensions and parameters;

GOST 32968-2014 Refrigeration equipment. Refrigeration agents. Application and extraction requirements;

GOST 33660-2015 Fans. Classification by efficiency;

GOST R 53296-2009 Installation of elevators in buildings and structures. Fire safety requirements;

GOST R 53301-2013 Fire dampers of ventilation systems. Test method for fire resistance.

GOST R 53303-2009 Construction structures. Fire doors and gates. Test method for smoke and gas permeability;

GOST R 53305-2009 Smoke screens. Test method for fire resistance;

SP 134.13330.2012 Telecommunications systems of buildings and structures. Basic design provisions;

SanPiN 1.2.3685-21 Hygienic standards and requirements to ensure safety and (or) harmlessness for humans of environmental factors.

N o t e - When using these construction standards, it is advisable to check the validity of the reference documents in the public information system - on the official website of the standardization body on the Internet or the Building Catalogue SK-1 (Index) in three parts (Building Catalogue Part 1, Building Catalogue Part 2, Building Catalogue Part 3), which is published as of January 1, 2019.

If a referenced document to which an undated reference is made is replaced, the current version of that document should be used, taking into account any changes made to that version. If a reference document to which a dated reference has been replaced, the version of this document with the year of approval (adoption) indicated above should be used. If a change is made to a referenced document to which a dated reference is made after the approval of these building standards that affects the referenced provision, the referenced provision should be applied without regard to this change. If the referenced document is repealed without replacement, the provision referenced should be applied to the portion not affecting that reference. It is advisable to check the information on the validity of norms and rules in the information fund of technical regulations and standards.

3 Terms and definitions, designations and abbreviations

The following terms with their respective definitions are adopted in these building codes:

3.1 **emergency ventilation:** Regulated (controlled) air exchange in the room, ensuring prevention of increase to dangerous values of concentrations of combustible gases, vapors and dusts in case of their sudden arrival in the protected room.

3.2 **ventilation:** The exchange of indoor air to remove excess heat, moisture, and harmful substances in order to provide an acceptable microclimate and air quality in the served room or work area.

3.3 **air lock (satellite):** A vertical section of ductwork that prevents the direction of air flow from one apartment to another and, in the event of a fire, smoke from the floors below to those above.

3.4 **hazardous substances:** Substances for which a maximum permissible concentration (MPC) has been established by the sanitary and epidemiological supervision authority.

3.5 **gas infrared emitter:** GII.

3.5.1 light: With open atmospheric burner without organized combustion products removal and the temperature of the radiating surface of more than 600 ° C.

3.5.2 dark: With fan gas burner unit, combustion products venting outside the room and the temperature of the radiating surface of less than 600 ° C.

3.6 **hydraulic and thermal stability of heating systems, heat supply systems:** ability of the system to maintain the specified design distribution of the coolant flow at variation of flow and heat transfer to all individual sections, heaters and other elements of the system.

3.7 **imbalance of air exchange:** The difference between the rates of air supplied to the room (building) and removed from it by ventilation, air conditioning and air heating systems with mechanical inducement.

3.8 **smoke inlet:** An opening or opening in a duct of a smoke exhaust ventilation system with a mesh or grating installed therein, or with a smoke hatch or normally closed fire damper installed therein.

3.9 **Protected room:** A room at the entrance to which, in order to prevent air leakage, there is a tambour-type airlock or is created

high or low air pressure in relation to adjacent rooms.

3.10 **fire damper:** Automatically and remotely controlled device for closing ventilation ducts or openings in the building envelope with fire resistance limit states characterized by loss of density and loss of thermal insulating capacity:

- normally open (closed in case of fire);
- normally closed (open in case of fire or after fire);
- double action (closable during a fire and open after a fire).
- Smoke damper: Normally closed fire damper, having a fire-resistance limit state, characterized only by loss of density, and to be installed directly in the openings of smoke exhaust shafts in the protected corridors and hallways (hereinafter - corridors).

3.11 **airtightness class (airtightness) of duct:** Permissible leakage/air suction through the material of the duct, connection, device or equipment of the ventilation system under operating conditions.

3.12 **Ventilation manifold:** A section of air duct to which the ducts from two or more floors are connected.

3.13 **Air conditioning:** Automatic maintenance of all or separate air parameters (temperature, relative humidity, cleanliness and mobility) in the serviced premises in order to provide the specified parameters of the microclimate, required to consider, optimal weather conditions, the most favorable for the well-being of people, conducting the technological process, ensuring the safety of the values.

3.14 **the serviced area of the room (living area):** The space in a room bounded by planes parallel to the floor and walls: 0.1 and 2.0 m above floor level for people standing or moving, and 1.5 m above floor level for people sitting (but no closer than 1 m from the ceiling for ceiling heating), 0.5 m from the interior surfaces of exterior and interior walls, windows and heaters.

3.15 **Heating:** Maintaining the rated temperature in enclosed spaces with an average unsafety of 50 hours/year.

3.16 **room without natural ventilation:** A room (including a corridor) without openable windows or openings in the outer building envelope or a room (corridor) with openable windows or openings with an area insufficient for the external discharge of combustion products, preventing the smoke in this room in case of fire.

3.17 **room with a high density of people:** A room with an area of 50 m^2 and more with a permanent or temporary stay of people in the number of more than one person per 1 m^2 of the area of the premises not occupied by equipment and interior items.

3.18 **smoke control ventilation:** Controlled (controlled) gas exchange of the internal volume of the building in the event of a fire in one of its rooms, preventing the damaging effects on people and (or) material assets of the spreading combustion products, causing an increased content of toxic components, an increase in temperature and a change in the optical density of the air environment.

3.19 **Smoke screen:** Automatically and remotely controlled device with a retractable curtain or a fixed structural element made of a smoke-proof material of flammability group G1 or higher on a non-combustible basis (mesh, woven fabric, e t c .).), installed in the upper part under the ceilings of protected rooms or in wall openings with a height lowering not less than the thickness of the smoke layer formed in a fire and designed to prevent the spread of combustion products under interfloor ceilings, through openings in walls and ceilings, as well as for design separation of smoke zones in protected rooms.

3.20 **Work area:** Space of a certain volume in the room, in which the presence of people is provided and the requirements for the parameters of the air environment are set.

3.21 **resultant room temperature:** Composite index of room radiation temperature and room air temperature.

3.22 **Exhaust air heat recovery:** Reuse the heat of the air removed from the room (building).

3.23 **Recirculation of air:** Mixing of air from a room with outdoor air and supplying this mixture to the same or other rooms (after cleaning or heat and humidity treatment) or mixing of air within the same room, accompanied by cleaning, heating (cooling) by heating units, fan and induction fans, fan-weirs, etc.

3.24 **Prefabricated duct:** A section of duct to which the ducts laid on one floor are connected.

3.25 **bellows compensator:** A device that compensates for the axial length change of a pipeline (when the pipeline is heated or cooled).

3.26 **ventilation system:** A complex of functionally interconnected equipment, installations, devices, air ducts that exchange air in the premises to remove excess heat, moisture, harmful substances in order to ensure acceptable weather conditions and air purity in the served or working area of the premises.

3.27 **building internal heating system:** A complex of equipment and devices providing conversion, distribution and supply of heat (coolant) to heat consuming installations (equipment) of the heating, ventilation, air conditioning and hot water supply systems of the building.

3.28 **Decentralized heating system:** A heating system in which the heat source and heat consumers are either combined in one unit or placed so close that the transfer of heat from the source to the heat consumers can be carried out almost without an intermediate link - a heating network.

3.29 **heating system:** A complex of equipment for artificial heating of air with a coolant (water, air, steam, thermal radiation, etc.) designed to heat rooms and compensate for heat losses in them.

3.30 **heat supply system:** A set of heat sources and heat-consuming installations technologically connected by heat networks.

3.31 **Refrigeration system:** Complex of equipment and devices for generating

cold and supplying it to air coolers of supply units and air conditioners.

3.32 **District heating system:** Heat supply system, in which the heat production source works to supply heat to a group of buildings and is connected by heating networks with heat consumers.

N o t e - The system consists of a heat source, a heat network, a heat point (CHP/CHP) or subscriber inputs and local heat consumer systems.

3.33 **direct cooling scheme:** A cooling scheme in which the air of the conditioned space is cooled in the heat exchanger by the working medium (refrigerant) of the refrigeration machine.

3.34 **smoke exhaust ventilation system:** Automatically and remotely controlled ventilation system designed to remove products of combustion in case of fire through the smoke inlet device to the outside.

3.35 **smoke inlet ventilation system:** Automatically and remotely controlled ventilation system designed to prevent smoke in a fire in security areas, stairwells, elevator shafts, air locks by supplying outside air and creating excess pressure in them, as well as to limit the spread of combustion products and compensate the volume of their removal.

3.36 **intercooling circuit:** A cooling circuit in which the air of the conditioned space is cooled in the heat exchanger by an intermediate coolant circulating in a closed circuit, and the intermediate coolant is cooled in the heat exchanger by the working medium (refrigerant) of the refrigerating machine.

3.37 **airlock: A** space-planning element designed to protect an opening of a fire barrier, separated by fire-resistant ceilings and partitions, containing two consecutive openings with fire-fillings or a greater number of similarly filled openings with forced supply of outside air into the internal space thus separated - in an amount sufficient to prevent smoke in the event of fire.

3.38 **Transit duct:** A section of ducting that is routed outside the room or group of rooms it serves.

4 General provisions

4.1 These building standards establish requirements for heating, ventilation, air conditioning, indoor heating and cooling systems to ensure comprehensive building safety, to protect and ensure the necessary level of safety of buildings under various natural and man-made impacts and phenomena, human life and health under adverse environmental impacts (including the necessary safe conditions for living and using systems in buildings and structures during operation) and effective

4.2 The design of heating, ventilation and air conditioning systems in buildings should include technical solutions that provide:

a) the required parameters of the microclimate and concentration of harmful substances in the air of the service area of residential, public buildings and public buildings of administrative purposes (hereinafter - public buildings), and administrative buildings and domestic buildings of enterprises according to GOST 30494 and requirements of these Construction Norms; b) required parameters of microclimate and concentration of harmful substances in the air in a working zone of production, laboratory and storage (hereinafter - production) buildings in buildings of any purpose according to GOST 12.1.005 and the requirements of these construction standards;

c) explosion and fire safety of internal heating and cooling, heating, ventilation and air conditioning systems in accordance with the Law of the Kyrgyz Republic "On Fire Safety";

d) permissible levels of noise and vibration in buildings during operation of equipment and systems of heating and cooling, heating, ventilation and air conditioning (hereinafter - heating and ventilation equipment) according to MSN 2.04-03.

N o t e - For emergency ventilation systems during operation or testing in rooms where this equipment is installed, according to GOST 12.1.003 noise source not more than 110 dBA constant sound power, and impulse noise - not more than 125 dBA sound power;

e) required air quality according to GOST 30494;

(e) The specified zone class of air in clean areas and rooms;

g) protection of atmospheric air from ventilation emissions of harmful substances;

i) Improving the energy efficiency of building systems;

j) Reducing the consumption of non-renewable natural resources by construction and operation;

k) availability and maintainability of internal heating, cooling, heating, ventilation and air conditioning systems.

l) During reconstruction, technical re-equipment and capital repair of industrial, residential, public and administrative buildings it is allowed to use the existing heating, ventilation, air conditioning and smoke ventilation systems by design assignment or feasibility study if they meet the requirements of these construction standards, the Law of the Kyrgyz Republic "On Fire Safety" and are in standard technical condition according to GOST 31937.

5. Calculation parameters of indoor and outdoor air

5.1 Room microclimate parameters (except for rooms for which they are established by other regulations) should be taken according to GOST 30494, GOST 12.1.5 to ensure air temperature, the resulting room temperature, relative humidity and air speed within these parameters in the service or working areas of the premises (on permanent and non-permanent jobs):

a) in the cold period of the year in the served zone of residential premises - the air temperature according to the optimal parameters of GOST 30494;

b) during the cold period of the year in the serviced area of public and administrative-domestic buildings or in the working area of industrial premises - the air temperature is the minimum of the permissible temperatures in the absence of excess heat in the premises or within the permissible parameters in the premises with excess heat. In production premises with an area of more than 50 m^2 per worker, it is permitted to provide the design air temperature only at permanent workplaces and a lower (but not below 10 °C) air temperature at non-permanent workplaces;

c) during the warm period of the year in the served or working area of the premises in the presence of excess heat - the air temperature within the permitted temperature limits, but not more than by 3 °C for public and administrative and domestic premises and not more than by 4 °C for industrial premises above the calculated outdoor temperature according to parameters A and not more than the maximum permitted temperature according to parameters B, and in the absence of excess heat - the air temperature within the permitted temperature limits;

d) air velocity - within the permissible values;

e) relative humidity - within the permissible values.

If the permissible parameters of the microclimate cannot be provided in the working or serviced area due to production or economic conditions, the permanent workplaces should be provided with air perfusion in accordance with 5.9, 7.1.17 and Annex E, apply cooling or heating panels, local air conditioners, mobile units, etc.

Microclimate parameters (or one of the parameters) may be taken within the optimal values instead of the allowable by the technical specification or economic feasibility study.

5.2 In the cold period of the year in the premises of heated buildings (except for the premises for which air parameters are set by other

The temperature of the air should be kept at a minimum by standby heating when they are not in use or when not in use during non-working hours:

15 °C - in residential areas;

12 ° C - in the premises of public and administrative buildings;

5 ° C - in production facilities.

By the beginning of operation (use) the temperature must be restored to normal.

N o t e - It is not allowed to use devices in heating systems of apartment buildings that allow users to reduce the temperature below the specified.

During the warm period of the year, the parameters of the microclimate are not regulated in residential areas, rooms, as well as public, administrative and industrial premises in the periods when they are not used, and during non-working hours, in the absence of technological requirements for the temperature conditions of the premises.

5.3 Microclimate parameters in the air conditioning of the premises (except for rooms for which the microclimate parameters are set by other regulatory documents or the design task) should be provided to ensure the air parameters within the optimal values:

a) in the service area of residential, public and administrative and domestic premises - according to GOST 30494 (Section 4);

b) in the working area of the production facilities or their individual sections, as well as in the workplaces of the production facilities, where the operator's work associated with neuro-emotional stress - according to GOST 12.1.005 and SanPiN 1.2.3685.

One of the parameters of the microclimate is allowed to take within the permissible values instead of the optimum according to the design task.

5.4 Indoor air quality in residential and public buildings should be provided in accordance with GOST 30494 the required value of air exchange in the premises.

For pre-school educational organizations, hospitals and clinics, optimal air quality indicators should be accepted.

For residential and public buildings, allowable air quality parameters should be accepted; optimal air quality parameters for these buildings should be accepted according to the design assignment.

5.5 For production facilities with fully automated technological equipment operating without the presence of people (except for on-duty personnel in a special room and

leaving the production room periodically for inspection and adjustment of equipment for not more than 2 hours continuously), in the absence of technological requirements for temperature conditions in the workplace air temperature in the work area should be taken:

a) during the cold season and transient conditions in the absence of excess heat - plus 5 ° C, and in the presence of excess heat - economically feasible temperature;

b) during the warm period of the year in the absence of excess heat - equal to the outside air temperature (parameters A), and in the presence of excess heat

– 4 °C above the ambient air temperature (parameters A), but not higher than 29 °C.

Places of production repair facilities (except for emergency)

In areas where repair work (other than emergency work) is carried out (duration 2h or continuously), the following must be ensured mobile units of air parameters:

- minimum allowable according to GOST 12.1.005 in the cold period of the year according to 5.1, list b);
- maximum allowable according to GOST 12.1.005 in the warm period of the year according to 5.1.

Relative humidity and air velocity in manufacturing facilities with fully automated technological equipment in the absence of special requirements are not regulated.

5.6 In livestock, fur farming and poultry buildings, structures for growing plants, storage of agricultural products, keeping birds and animals' microclimate parameters should be taken in accordance with the requirements of technological design of these buildings.

5.7 The maximum air velocity and temperature in the supply air stream at the entrance to the served or working area (at workplaces) of the room should be taken into account, taking into account the allowable deviations from the required values according to Appendices D and E. When air diffusers are located within the served working area of the premises, air velocity and temperature are not regulated at a distance of less than 1 m from the air diffuser. For local supply air directly to the breathing zone of a person (personal ventilation) air velocity and temperature are determined in accordance with 5.1.

5.8 In rooms with radiant heating and heating (including gas and electric infrared emitters) or cooling permanent workplaces, the air temperature should be taken by calculation, providing the temperature conditions (the resulting room temperature), equivalent to the required air temperature in the served (working) area of the room.

The resulting air temperature in the served or working area must be at least 1 °C below the maximum allowable temperature during the cold season and not below the minimum allowable temperature during the cold season by more than 3 °C for public and 4°C for production facilities.

During thermal exposure of workers, the temperature of the air in the workplace shall not exceed: 25°C - for work category Ia; 24°C - Ib; 22°C - IIa; 21°C - IIb; 20°C -

III.

To prevent the adverse effects of infrared radiation on the human body, the intensity of thermal radiation during heating and heating should not exceed the values specified in SanPiN 2.2.4.548:

- 15 W/m^2 - on the surface of unprotected parts of the head at the air temperature corresponding to the lower limit of permissible values;

- 25 W/m^2 - on the surface of the human torso, arms and legs at an air temperature corresponding to the lower limit of optimal values;

- 50 W/m^2 - on the surface of the human torso, arms and legs at the air temperature corresponding to the lower limit of permissible values.

The maximum intensity of infrared irradiation of the surface of the torso, arms and legs must not exceed 140 W/m^2 in permanent and 250 W/m^2 in non-permanent workplaces. At the same time, no more than 25% of the body surface should be exposed to radiation, and the use of personal protective equipment, including face and eye protection, is mandatory.

5.9 In the production rooms of hot shops when irradiating with a surface density of radiant heat flux of 140 W/m^2 and more, cooling panels or perfuming of workplaces with air should be provided; the temperature and speed of air movement at the workplace should be taken according to Annex E. In the rest rooms of hot shops, air temperature should be 20 °C in the cold season and 23 °C in the warm season.

5.10 The concentration of harmful substances in the working air in the workplace in the production facilities in the calculation of radiant heating and heating, ventilation and air conditioning should not exceed the maximum permissible concentration in the air of the working area, established by GOST 12.1.005, as well as the regulatory documents of the sanitary-epidemiological supervision.

5.11 The concentration of pollutants in the supply air at the outlet of air diffusers and other air inlets should be taken according to calculation, taking into account the background concentrations of these substances in the location of air intake devices, but not more:

a) 30% of MPC in the air of the working area - for production and administrative and household premises;

b) MPC in the air of populated areas - for residential and public premises.

5.12 Microclimate parameters in the air conditioning of clean rooms should be provided for the working or service area:

- of air purity of the appropriate class adopted by the design task;

- air parameters within the optimum standards according to 5.3 or according to the design task.

5.13 The specified parameters of the microclimate in the rooms of residential, public, administrative and industrial buildings should be provided within the design parameters of outdoor air by SNIP KR 23-02 for the relevant areas of construction:

parameters A - for ventilation and air blowing systems during the warm period of the year;

parameters B - for heating, ventilation and air blowing systems in the cold season, as well as for air conditioning systems in warm and cold seasons.

The value of the specific enthalpy and moisture content of outdoor air in the warm period of the year (parameters B) should be taken as the maximum for the given climatic region.

Outdoor air parameters for transient conditions of the year should be taken: a temperature of 10 °C and a specific enthalpy of 26.5 kJ/kg or outdoor air parameters at which change the modes of operation of equipment consuming heat and cold.

5.14 Outdoor air parameters for agricultural buildings, if they are not established requirements for building structures or technological requirements, should be taken:

parameters A - for ventilation and air conditioning systems during warm and cold periods of the year;

parameters B - for heating systems in the cold period of the year.

5.15 According to the design task, it is allowed to take outdoor air parameters lower in the cold season and higher in the warm season than the design parameters of outdoor air according to 5.13, 5.14 when justifying.

5.16 Providing the specified microclimate parameters in residential, public, administrative and industrial premises for the design modes of cold and warm periods of the year should be confirmed by calculations or in non-standard cases by methods of mathematical modeling.

5.17 In the technical solutions of heating, ventilation and air conditioning systems should be provided the possibility of automatic autonomous regulation of the microclimate parameters of the premises.

6 Internal heating and heating systems

6.1 Heat supply systems

6.1.1 Heat can be supplied to buildings:

- by heat networks of the centralized heat supply system from a heat source (CHP, RTS, stand-alone boilers);
- from individual heat generators of the decentralized heating system;
- from the AIT serving one building or a group of buildings (built-in, attached or roof boiler house, cogeneration or TST);
- from a combined heat source - hybrid heat pump heating and cooling systems, working in conjunction with a district heating system or a decentralized heating system);
- from an autonomous heat generator serving the apartments of one entrance of an apartment building with a cascade connection scheme.

6.1.2 The internal heating systems of buildings of various purposes should be connected to the district heating networks or an autonomous heat source through automated central, individual or apartment heating substations that provide the calculated hydraulic and thermal modes of internal heating systems, as well as automatic regulation of heat consumption in heating and ventilation systems depending on the outdoor temperature. The capacity of the heat point shall meet the heat demand of the building.

6.1.3 With the centralized heat supply scheme, it is recommended to connect the internal heating and heating systems of residential and public buildings by an independent scheme through the CHP/ITP.

Internal heating and heating systems are allowed to connect according to the dependent scheme:

- in the centralized heat supply of production and administrative and household buildings;
- when buildings are supplied with heat from an autonomous heat source.

6.1.4 Connection of heating systems to district heating networks through an elevator, including an automated one, is not allowed, but it can be used in the circulation pump bundling as a backup mixing device in case of emergency power outage in areas with unstable power supply.

6.1.5 For centralized heating of a group of low-rise buildings (up to and including three floors), it is allowed to connect them to the heating networks through the CHS with automatic regulation of heat supply to the intra-block heating networks and the parameters of the coolant circulating in these networks, corresponding to the required for the heating systems of the buildings connected to them.

6.1.6 The heating units built into buildings should generally be located in separate rooms near the exterior walls of the buildings.

Exits from the heating unit must be provided:

- if the length of the heating unit room is 12 m or less and located at a distance of less than 12 m from the building exit to the outside - one exit to the adjacent room, corridor or stairwell, and if the heating unit is located at a distance of more than 12 m from the building exit - one independent exit to the outside;
- if the length of the heating unit room is more than 12 m - two exits, one of which should be directly outside, the second - to the adjacent room, stairwell or corridor. The rooms of the heat points of steam consumers must have at least two exits regardless of the size of the room.

In the absence of such a possibility, installation of attached or freestanding heating units is allowed when justified and according to the design assignment.

The height of the premises from the clear floor level to the bottom of the projecting structures of the floor (in light) is recommended to take at least: for above-ground CHP - 4.2 m; for underground - 3.6 m; for the BFS - 2.2 m. When placing the ISTs in the basement and basement rooms, as well as in technical cellars of buildings allowed to take

the height of the rooms and free passages to them at least 1.8 m.

In a boiler room should be placed a common house heat meter that measures the total heat consumption of the building and the water meter of cold water for hot water supply.

6.1.7 The internal heating systems of the buildings must have hydraulic and thermal stability.

When a group of apartment buildings is connected through a CHP/ITP, the automatic regulation of heat supply to the internal heating and heating systems of these buildings shall be carried out in each house (part of the house) in an automated control unit for heating and internal heating systems.

6.1.8 In buildings with intermittent operation, it is recommended to provide for automatic reduction of heat supply to the heating system of that building during non-working hours.

6.1.9 In public and industrial buildings, commercial metering of heat consumption in internal heating systems should be provided for the entire building.

In one building for groups of rooms of different purposes or groups of rooms intended for different tenants (owners), the design assignment should include individual heat metering units.

6.1.10 In residential multi-family buildings, commercial metering of heat consumption for the building, as well as metering and regulation of heat consumption for each apartment should be provided in the internal heating systems. In buildings with vertical (riser) distribution of heating systems should provide for apartment-by-apartment metering of heat consumption by installing radiator heat distributors or other similar devices.

In a complex of apartment buildings with a single central heating system, the need for commercial metering of heat consumed by each building must be justified or accepted by the technical specification.

6.1.11 For internal heating systems, water should be used as the heat transfer medium. Water steam, as well as other heat carriers (except pool water heating systems, etc.), should be used if they meet the requirements of hygienic and explosion and fire safety.

6.1.12 The use of electric energy for heating purposes is allowed for the drives of heat pump systems of heat and cooling.

Direct transformation of electric energy into heat energy (direct electric heating) for heating, air heating in air heaters or in air/heat curtains (except for explosion and fire hazardous premises of categories A and B) is allowed (taking into account the restrictions set out in Annex B) with an appropriate technical and economic justification and according to the design task taking into account local opportunities and conditions.

6.1.13 The temperature of the coolant for internal heating and heating systems should be taken:

- in residential and public buildings and complexes not more than 95 °C;

- for production not more than 115 °C.

6.1.14 In domestic heating and heating systems with pipelines made of polymeric materials, the coolant parameters (temperature, pressure) must not exceed 90 ° C and 1.0 MPa, and the allowable values for the specified class of operation of pipes and fittings according to GOST 32415.

6.1.15 The temperature of the heating medium for heating and heating systems of air heaters of air handling units, air conditioners, air/heat curtains, etc. (hereinafter referred to as internal heating systems) should be taken not less than 20 °C below the auto-ignition temperature of the substances in the served room and not more than the maximum allowed by Appendix B or in accordance with the technical characteristics of the equipment, fittings and piping.

6.2 Heating systems

6.2.1 The design documentation of the building or structure must include technical solutions to ensure thermal and hydraulic stability of heating systems during changes in external and internal operating conditions of the building or structure during all periods of the year.

Heating systems must provide in heated rooms the rated air temperature according to Section 5 during the heating period at the design parameters of the outside air.

6.2.2 Heating systems should provide the required room temperature, taking into account:

- heat loss through the building envelope;

- the heat consumption for heating the outdoor air penetrating into the premises due to infiltration or by organized inflow through window valves, shutters, transoms and other devices for ventilation of the premises in the volume of the standard air exchange, if these premises are not provided with mechanical fresh air ventilation;

- heat consumption for heating materials, equipment and vehicles;

- heat flow that regularly comes from electrical appliances, lighting, process equipment, pipelines, people and other heat sources.

6.2.3 Calculation of space heat losses for heating systems and heat consumption for ventilation systems is recommended to perform in accordance with Appendix A.

Heat loss through the internal envelope of the rooms is not allowed to take into account if the temperature difference between the air in these rooms does not exceed 3 °C.

6.2.4 The choice of heating system, heat supply system of air heaters of air handling units, air conditioners, air curtains, etc., the type of coolant, the maximum allowable temperature of the coolant, type of heaters and air heaters should be provided taking into account the purpose of heated premises in residential, public and

administrative and domestic buildings or categories of industrial premises according to Appendix B.

6.2.5 In unheated buildings to maintain the temperature corresponding to the technological requirements in individual rooms and zones, as well as in temporary workplaces when setting up and repairing equipment, local heating should be provided.

6.2.6 In central heating systems, automatic regulation of heat output of heating devices should be provided. In this case, the automatic control device should be with a limited range of regulation of the air temperature in the room according to 5.2.

6.2.7 Heating of stairwells should be designed taking into account the results of the calculation of the resistance to heat transfer of internal walls separating the stairwell from residential and other premises.

Heating of stairwells is not allowed:

- in unventilated stairwells type H1;

- for buildings equipped with apartment heating systems and apartment heating systems, as well as for buildings with any heating systems in areas with a design outdoor air temperature for the cold period of the year minus 5X and above (parameters B).

In unheated stairwells, measures must be taken to prevent the formation of ice on the steps of flights of stairs and landings.

6.2.8 Premises of explosion and fire hazard categories (hereinafter - in the premises of categories) A and B should be provided:

- air heating according to Appendix B;

- other heating systems according to Appendix B, with the exception of water heating systems for premises in which substances that form in contact with water or water vapor are stored or used explosive mixtures, or substances capable of self-ignition or explosion upon interaction with water.

6.2.9 Pressure losses in water heating systems should be:

- in risers of single-pipe systems and instrument assemblies of vertical two-pipe systems - at least 70% of the total pressure losses in the circulation rings without taking into account the pressure losses in the common areas;

- in risers of single-pipe heating systems with lower distribution of supply and upper distribution of return - at least 300 Pa for each meter of riser height;

- in two-pipe vertical and one-pipe horizontal heating systems in the circulation rings through the upper devices (branches) - not less than the natural pressure in them at the calculated parameters of the coolant.

The available water pressure difference in the supply and return pipes for water circulation in the heating system should be determined taking into account the pressure arising from cooling water in the pipes and heating devices.

The unaccounted circulation pressure losses in the heating system should be taken equal to 10% of the maximum pressure losses.

Pressure loss mismatch in the circulation rings (excluding pressure losses in the

common sections) should not exceed 5% in the associated and 15% in the dead-end pipelines.

6.2.10 Water heating systems should be designed to be regulated without the use of constant-section throttling devices.

6.2.11 To ensure the hydraulic stability of heating systems as well as the stable operation of the thermostats, automatic balancing valves should be installed on the system risers or on its horizontal floor branches, including in front of the manifold of apartment heating systems:

- of differential pressure regulators in two-pipe heating systems;
- flow controllers in single-pipe heating systems, regardless of their calculation methods.

The design of balancing valves should allow for measurement of flow rates and/or pressure drops, by means of special instruments.

Devices that allow the heating medium to be bypassed from the supply to the return piping of heating systems shall not be used on the distribution floor combs in apartment heating systems in residential buildings.

For constant flow heating systems (without thermostats or other control devices), manual balancing valves may be installed with a preset mounting position corresponding to the hydraulic calculation data.

6.2.12 The nominal heat flow of the heater must not be less than the design heat flow. The nominal heat flow of a heater with a thermostat should be 10 to 15 % greater than the calculated heat flow, so that the user can select a comfort temperature range within the optimum limits and compensate for unaccounted-for additional heat losses.

When calculating the surface of the heaters, you should consider the heat flow from the pipelines of the heating system into the room in the case of open laying.

6.2.14 Radiant heating and heating systems with dark and light gas and electric infrared emitters are allowed:

- in open areas;
- in production rooms of categories B2, B3, B4, G and D (without emission of combustible dust and aerosols of functional fire hazard class F5.1;
- in warehouses (without emission of combustible dust and aerosols) categories B2, B3, B4, D class F5.2 (except book depositories, archives, high-storage warehouses);
- in parking lots of categories B2, B3 - dark infrared emitters according to the design assignment;
- in premises of agricultural buildings of class F5.3 (except light infra-red emitters);
- in the premises of entertainment and cultural and educational institutions of class F2.3 (theaters, cinemas, concert halls, sports facilities with stands), class F2.4 (museums, exhibitions, dance halls), located outdoors;
- on the premises of sports and recreation complexes and sports and training

facilities (without stands for spectators) class F3.6.

6.2.14 Heating and heating systems with gas and electric infrared emitters should not be used:

- in the premises of the basement and ground floor;
- in buildings of V degree of fire resistance;
- in hazardous areas of production facilities and warehouses;
- in the parking and repair areas of motor vehicles operating on the natural gas;
- in buildings of any degree of fire resistance classes of structural fire hazard C1, C2 and C3.

6.2.15 The heating systems should include devices for venting and emptying them.

Fittings should be provided on each riser pipe with connections for connecting hoses for draining water or evacuating air. In horizontal heating systems, devices should be provided for emptying them on each floor, regardless of the number of floors of the building.

In horizontal heating systems with polymer pipes, instead of draining water, it is allowed to use compressed air to blow the system through special fittings on the floor (apartment) distributors or individual branches of the system.

6.2.16 Air removal from heating systems with water as the heating medium and from condensate pipelines filled with water should be provided in the upper points, in the case of the heating medium steam - in the lower points of the condensation gravity flow pipeline.

In water heating systems, flow-through air collectors or cocks should be provided for air release. Non-flow-through air collectors are allowed when the water velocity in the pipeline is less than 0.1 m/s.

6.3 Pipelines

6.3.1 Pipelines of internal heating systems should be provided from steel, copper, brass, heat-resistant polymeric (including reinforced) pipes.

Do not use copper and aluminum alloy system elements in the same circuit.

It is not allowed to use used and refurbished steel pipes, materials and fittings in the design documentation for construction, reconstruction and overhaul of buildings and structures of higher and normal responsibility levels.

P a g e

1 When selecting polymeric pipelines, you should consider the durability of the pipe with the stated parameters of use.

2 Do not use polymeric piping in heating systems with elevator connection.

3 Do not use polymeric piping in heating systems without the implementation of additional measures that exclude mechanical and thermal

damage to pipes, as well as direct exposure to ultraviolet radiation.

6.3.2 For hydraulic calculations, it is recommended to take the equivalent roughness of the inner surface of pipelines made of new steel pipes of internal heating systems to not less than 0.2 mm for water, steam and other heat carriers and 0.5 mm for condensate.

For dependent connection of internal heat supply systems to the heating network, as well as when using existing pipelines made of steel pipes (according to 4.4), the equivalent roughness should be taken at least 0.5 mm for water, steam and other heat carriers and 1.0 mm for condensate.

The equivalent roughness of the inner surface of pipes made of polymeric materials, as well as copper and brass pipes should be taken at least 0.01 and 0.11 mm respectively.

6.3.3 Oxygen permeability of polymeric pipes used in heating systems together with metal pipes or appliances and equipment that have restrictions on the content of dissolved oxygen in the heat transfer medium must not exceed 0.1 g/(m^3 -day).

6.3.4 Connection of pipelines made of polymeric pipes with steel pipelines, shut-off and control valves and heating devices should be made on the threads with special fittings.

6.3.5 Pipelines of internal heating systems are not allowed to be laid:

a) in the attics of buildings (except for warm attics) and in ventilated basements in areas with a design temperature of minus 40 °C and below (parameters B);

b) transit - through the premises of protective structures of civil defense and mines with electrical cables;

c) in the same shaft (channel) - with pipelines of flammable, corrosive liquids, vapors and gases;

d) in the same shaft - with the ducts through which the explosive mixtures move.

It is allowed to lay transit pipelines without detachable joints in a protective casing through electrical rooms, pedestrian galleries and tunnels.

6.3.6 The velocity of the coolant in the pipelines of internal heating and heating systems should be taken depending on the permissible equivalent sound level in the room according to Annex I.

6.3.7 The velocity of steam in the pipelines of internal heating and heating systems should be taken:

a) in low-pressure systems (up to 70 kPa at inlet) with passing steam and condensate - 30 m/s, with oncoming - 20 m/s;

b) in high-pressure systems (from 70 to 170 kPa at the inlet) with passing steam and condensate - 80 m/s, with oncoming - 60 m/s.

6.3.8 Slopes of water, steam and condensate pipelines should be taken not less than 0.002, and the slope of steam pipelines against the flow of steam - not less than 0.006.

At all low points in the piping system, vent valves must be provided to allow the system to be emptied. At all higher points, air vents or cocks must be installed to allow air to be vented.

6.3.9 Diverting pipelines of internal heating and heating systems are allowed to be laid without a slope in cramped conditions, as well as at a rate of water flow in the pipelines:

- of steel pipes - 0.25 m/s or more;
- of copper and polymer pipes - 0.1 m/s or more.

On these pipelines, it is necessary to provide additional nipples directed upwards from the side opposite the location of the drain valve in this area, to be able to connect a compressor for blowing out compressed air pipelines during repair work.

In horizontal apartment heating systems, it is allowed to lay pipelines without a slope.

6.4 Heating appliances and fittings

6.4.1 In rooms with the release of combustible dust (hereinafter - combustible dust) categories A, B, B1 - B3 heating appliances water and steam heating systems should be provided with a smooth surface that allows easy cleaning:

- Sectional or panel single radiators;
- smooth pipes or heating panels.

6.4.2 Heating appliances in rooms of categories A, B, as well as B1, B2 with combustible dust emission should be placed at a distance (in the light) of more than 100 mm from the wall surface, it is not allowed to place radiators in niches.

6.4.3 In rooms for filling and storing cylinders with compressed or liquefied gas, as well as in the premises of the warehouses of categories A, B, B1 heating devices should be shielded from non-combustible materials at a distance of at least 100 mm (in the light) from the heating devices, providing access to them for cleaning.

6.4.4 In the stairwells are not allowed to place piping with flammable gases and liquids, built-in cabinets, except cabinets for

communications, as well as to place equipment protruding from the plane of the walls at a height of up to 2.2 m from the surface of the treads and landings of stairs.

Cabinets for communications may be provided protruding from the walls while maintaining the standard width of escape routes and marking the protruding structures.

6.4.5 In apartment heating systems, heat flow meters, control and shut-off valves for each apartment on branches from riser pipes should be placed in special cabinets or niches on the serviced floors outside the apartments, providing free access to them for maintenance personnel.

6.4.6 Heating appliances in residential buildings should be placed under or in the immediate vicinity of light openings (windows or window combinations), in places accessible for inspection, repair and cleaning.

The length of the heater should be determined by calculation and be as long as possible to cover the width of the skylight (window) in medical organizations, preschool educational organizations, general educational organizations, residential homes for the elderly and disabled.

In apartment heating systems, heaters should be connected to the distribution polymeric pipelines through special fittings and fittings. It is not allowed open laying of plastic pipes without protection against mechanical damage to the connection headset.

When open laying plastic pipes to protect them from mechanical damage, it is necessary to provide special plinths, boxes and other structures that allow, if necessary, to provide access to the pipes and places of their connections.

6.4.7 Heating appliances in medical rooms must be of a streamlined design, with smooth surfaces for cleaning and disinfection. There should be unobstructed access to the heating devices.

6.4.8 Heating appliances in stairwells should be placed in the lower part, if the stairwell is divided into fire compartments - in the lower part of each compartment.

Heating appliances should not be placed:

- in compartments of vestibules with exterior doors;
- in stairwells, including unventilated, if the heaters protrude from the plane of the walls at a height of less than 2.2 m from the surface of the treads and landing.

Heating devices in the stairwell should be connected to separate branches or risers of heating systems.

6.4.9 It is allowed to install heaters, if they are fenced to prevent injury to people, on the platforms of stairwells, in corridors, elevator halls, including functionally combined with fire safety zones, and at the exit from the building while maintaining the standard width of the evacuation route in accordance with the Law of the Kyrgyz Republic "On Fire Safety".

6.4.10 Control valves should be installed at the heating devices.

In residential and public buildings, automatic thermostatic control valves should be

installed at radiators. The thermostatic valves must be preset to prevent the internal air temperature from dropping below the temperature specified in section 5.2.

When using decorative screens or when access to heaters is inconvenient, the thermostats should have a thermostat head with a remote sensor.

In rooms where there is a risk of freezing of the heating medium, the control valves at the heating devices must be protected against their unauthorized closing.

Control valves for single-pipe heating devices should be designed with a minimum hydraulic resistance, and for devices of two-pipe systems - with an increased resistance.

6.4.11 Radiant heating appliances (including gas and electric infrared emitters) with a surface temperature above 150°C should be placed in the upper zone of the room or on building structures of fire hazard class K0.

6.4.12 Gas emitters are allowed to be used under condition of combustion products removal, ensuring MPC of harmful substances in the air of the working or served zone below the permissible values, taking into account Note 4 to Table B.1, as well as under condition of installation of methane and carbon monoxide gas alarms, which activate when the room gas content reaches 10% of the MACPR or the MPC of natural gas. The gas alarms shall be interlocked with quick shutoff valves installed at the gas inlet to the room and shutting off the gas supply at the signal of the gas level.

6.4.13 The surface temperature of low-temperature radiant heating panels of workplaces should not be taken above 60 °C, and radiant cooling panels - below 2 °C.

The surface temperature of high-temperature radiant heating devices should not be taken above 250 ° C.

6.4.14 In electric heating systems it is allowed to use electric heaters with a level of protection against electric shock class 0 and the temperature of the heat emitting surface below the allowable for the premises in Annex B, with automatic regulation of the heating element heat output depending on the indoor air temperature.

7 Ventilation, air conditioning and air heating

7.1 General provisions

7.1.1 Ventilation should be used to ensure the required air quality and microclimate parameters in the premises.

Ventilation and air conditioning systems must ensure that the air supplied to the premises does not exceed the maximum permissible concentrations for such premises or for the working area of the production facilities.

In the design documentation of the building or structure with rooms with people staying must be provided for measures to:

- limitation of penetration of dust, moisture, harmful and unpleasant smelling

substances from the atmospheric air into the premises;

- Ensuring air exchange sufficient for the timely removal of harmful substances from the air and maintaining the chemical composition of the air in proportions favorable for human activity;

- Prevent the penetration of harmful and unpleasant smelling substances and exhaust gases from built-in parking lots into the rooms with permanent occupancy.

7.1.2 Air conditioning should be taken:

- to ensure that the microclimate and air quality parameters are within the optimal values;

- to ensure the microclimate and air quality parameters within the permissible values, if they cannot be provided by ventilation during the warm period of the year without the use of artificial air cooling;

- to ensure the microclimate and air quality parameters required for the technological process, according to the design task.

For residential and public buildings, if technically possible, central air conditioning systems should be carried out. The use of decentralized and individual air conditioning systems with the location of their elements on the facades of buildings is allowed only on the technical specifications and in agreement with the expert bodies.

N o t e - When air conditioning the air velocity in the served or working area of the premises (at permanent and non-permanent workplaces) may be taken within the allowable values according to the technical specification.

7.1.3 Ventilation with mechanical stimulation, including partial use of natural ventilation systems for the inflow or removal of air (hereinafter - mixed ventilation) should be provided:

- if the parameters of the microclimate and air quality are not provided by ventilation with natural inducement during the year;

- for rooms and areas without natural ventilation.

7.1.4 For public buildings should provide mechanical supply and exhaust ventilation in accordance with the requirements of the relevant sections of the building codes or by technological specifications.

7.1.5 In the premises with a volume per employee of not less than 40 m^3 for industrial premises and not less than 30 m^3 for public facilities with natural light in their light openings in the outer envelopes, it is allowed when justified to use periodic ventilation through transoms and shutters.

7.1.6 Mechanical ventilation should be provided for public and administrative and amenity rooms in areas with a design outdoor air temperature of minus 40 °C and below (parameters B).

7.1.7 Ventilation systems serving one or more rooms on one or more floors of residential buildings should be designed:

- with centralized supply and exhaust units with supply of prepared outside air

and maintaining the set temperature of the supply air;

- with individual apartment supply and exhaust units;
- with individual room air inlets (breezers).
- with special opening structures (valves) in building envelopes or windows to provide air supply and air removal using mechanical inducement;
- with natural air inlet and outlet (according to the design assignment and with technical (calculation) justification).

In this case, the design of ventilation systems should exclude the inflow of air from one apartment to another.

In order to save fuel and energy resources, it is recommended to provide mechanical supply and exhaust ventilation with heat recovery of exhaust air for the living quarters of apartment buildings.

7.1.8 Central ventilation systems of residential buildings with mechanical stimulation should be redundant in accordance with 7.2.9.

When using hybrid ventilation systems with natural air intake and exhaust during cold and transitional periods and with mechanical stimulation of air exchange during the warm period of the year, it is recommended that fans of these systems be designed to maintain the calculated vacuum at the inlet spigot by using a controlled drive to enable the use of natural stimulation during transitional and cold periods of the year.

The installation of ventilation systems should be carried out taking into account the requirements of 7.2,

7.10 not allowing installations to be located directly above, under or adjacent to living spaces and ensuring that the noise and vibration levels in the living spaces are within the normative limits.

7.10.9 The design of ventilation and air conditioning systems, taking into account possible layouts, must exclude the flow of air from one apartment (apartment) to another. Vertical collection ducts may be provided as common or separate for kitchens and sanitary units located under each other on the floors of the building. If a common vertical collection duct is used, the exhaust devices from the kitchens and sanitary units shall be connected to it through separate satellites. For air intake under the doors of the kitchens and sanitary units a gap of 0.03 m should be left or a grid with a live cross-section of at least 0.03 m should be installed at the floor[2] .

Inside apartments, it is not allowed to combine the ventilation ducts of kitchens and sanitary units with the ducts of living rooms.

It is allowed to combine the ducts of exhaust ventilation systems of kitchens and sanitary units, provided that individual apartment supply and exhaust units with heat recovery of exhaust air and exhaust air over the roof through the system of general ventilation.

7.10.10 To clean the supply air in systems with mechanical stimulation serving residential and public areas, filters should be used that provide the required degree of air purification.

7.10.11 When equipping residential, public, administrative and domestic premises with natural exhaust ventilation, the disposable pressure and network parameters should be calculated on the difference of densities of outdoor air with a temperature of 5 ° C and indoor air with a temperature for the cold period of the year. The supply of outdoor air into the premises in this case should be provided through special air inlets in the outer walls or windows or through individual supply and exhaust devices.

7.10.12 Natural ventilation for production facilities should be calculated:

a) on the difference of densities of outdoor and indoor air at the calculated parameters of the transition period of the year - for heated rooms without excess heat; at the calculated parameters of the warm period of the year - for the rooms with excess heat;

b) on the effect of wind at a speed equal to 1 m/s in the warm period of the year, for rooms without excess heat.

7.10.13 Mechanical ventilation with external air supply (around the clock and all year round) should be provided, ensuring air pressure, in the rooms of machine rooms of elevators of buildings of categories A and B, as well as in the vestibule airlocks:

- A and B categories of premises;

- rooms with the release of harmful gases, vapors or aerosols of hazard classes 1 and 2. The construction of a common vestibule-gateway for two or more rooms of categories A and B is not allowed.

7.10.14 Supply and exhaust or exhaust mechanical ventilation should be provided for pits of depth 0.5 m or more, for inspection channels with daily maintenance, and located in rooms of categories A and B, or in rooms that emit harmful gases, vapors or aerosols with a density greater than air density.

7.10.15 Ceiling fans and fans-vectors (except those used for air perfuming of workplaces) should be provided in addition to the supply ventilation systems for periodic increase in air velocity during the warm season above the allowable under GOST 30494, but not more than 0.3 m/s in the workplace or individual areas of the premises in public, administrative and residential and industrial buildings located in climatic region IV, as well as by design assignment in other climatic regions.

7.10.16 Air perfuming of permanent workplaces should be provided with outdoor air or a mixture of outdoor and recirculation air, or with cooled air during irradiation radiant heat flux with a density of more than 140 W/m^2 in accordance with 5.9.

In the melting, foundry, rolling and other hot shops is allowed to perfume the workplaces with the internal air of the aerated aisles of these shops with or without air cooling.

7.10.17 Cut-off air curtains should be provided to prevent the spread of harmful substances:

- to permanent workplaces with open technological processes accompanied by emission of harmful substances, and the inability to provide shelter or local exhaust ventilation;

- between rooms, one of which emits harmful substances.

7.10.18 Air heating in the rooms should be provided taking into account Appendix B. In the air heating system, the air flow rate should be determined according to Appendix D.

7.10.19 In air heating systems, the temperature of air at the outlet of air diffusers should be calculated taking into account the permissible temperature and velocity in the supply air stream at the entrance to the served or working area according to 5.7, but should not exceed 70 °C and not less than 20 °C below the auto-ignition temperature of gases, vapors, aerosols and dust emitted in the room.

7.10.20 Dust-free air in mechanical ventilation and air conditioning systems must ensure that the dust content in the supplied air does not exceed:

a) MPC in the atmospheric air of settlements - when it is supplied to the premises of residential and public buildings;

b) 30% of MPC in the air of the working area - when it is supplied to the premises of production and administrative and household buildings;

c) 30% MPC in the air of the working area for dust particles no larger than 10 microns - when fed into the crane operator cabins, control posts, the breathing zone of workers, as well as in the air blowing.

7.10.21 In local suction systems, the concentration of flammable gases, vapors, aerosols and dusts in the air should not exceed 50% of the NEQ.

7.2 Ventilation, air conditioning and air heating systems

7.2.1 Systems of general ventilation, local exhaust, air heating and air conditioning (hereinafter - ventilation systems) should be provided, ensuring the necessary safety requirements, taking into account functional purpose of the premises, the functional fire hazard class of residential, public and administrative buildings, the category of fire and explosion hazard of industrial premises, the given parameters of the microclimate, the possibility of recirculation, mode and simultaneous operation of systems, as well as the requirements of regulatory documents.

7.2.2 Ventilation systems should be separate for groups of rooms located in different fire compartments.

Premises of the same category of fire hazard, not separated by fire barriers, as well as having openings with a total area of more than 1 m^2 to other rooms can be considered as one room.

7.2.3 General ventilation systems for groups of rooms located within one fire

compartment should be provided taking into account the functional fire hazard class of the premises of residential, public and administrative buildings, as well as categories of fire and explosion hazard of industrial and storage facilities for the following groups of rooms:

(a) Residential;

b) public (except premises with mass occupancy) and administrative-domestic or industrial categories B4 and D (in any combination);

c) production facilities of one of the categories A or B, placed on no more than three (separately or sequentially) floors;

d) production of one of the categories B1, B2, B3, B4, D, or warehouse category B4 and D;

e) production categories B1, B2 and B3 and B4 in any combination, provided that fire dampers are installed normally open on the collection duct of each room joined by a common ventilation system;

f) storage of one of the categories A, B, B1, B2 or B3, placed on no more than three (separately or sequentially) floors;

g) production categories A, B, B1, B2, B3 and B4 in any combination or storage categories A, B, B1, B2, B3 and B4 in any combination with a total area not exceeding 1,100 m^2 , placed in a separate single-storey building with doors from each room only to the outside;

i) one category of fire hazard in underground (up to five underground floors) or above ground (up to nine above ground floors) enclosed parking lots, subject to the installation of normally open fire dampers on the ducts, taking into account the requirements of paragraph 7.3.20;

j) production categories B4, G and D and storage categories B4 and D (in any combination) subject to the installation of normally open fire dampers on the air ducts serving the premises and warehouses of category B4.

7.2.4 The following groups of rooms may be combined into one ventilation system by joining other rooms to the main group:

a) to the production categories B1, B2, B3 - administrative, residential, technical and public (except premises with mass occupancy of people
– more than 1 person per 1 m^2 premises with an area of 50 m^2 and more);

b) production facilities of categories A, B (except for systems specified in 7.2.13) and categories B1, B2 or B3 - production (including storage) facilities of any category except D. Production facilities of categories A and B should be classified as main premises;

c) toilets, showers, rooms and rooms for cleaning equipment.

Groups of rooms according to a) and b) of this paragraph may be combined into one system, provided that a normally open fire damper is installed on the collection duct of the connected group of rooms.

The main group of premises should include groups of premises whose total area is larger than the total area of the premises to be connected. The total area of the premises to be connected should not be more than 300 m^2 .

7.2.5 General ventilation systems should be provided for groups of laboratory rooms of research and production purposes, located within one fire compartment on no more than 11 floors (including technical and basement), categories B1 - B4, D and D and for groups of administrative and household rooms in any combination, as well as with the connection to them not more than two (on different floors) storerooms category A (each with area not more than 36 m^2) for storing the operational stock of test substances according to 7.2.4 b).

7.2.6 General supply ventilation systems with air recirculation should be provided for groups of rooms, taking into account 7.3.11, 7.3.13 - 7.3.15, in which air recirculation is allowed.

Groups of rooms in which air recirculation is allowed should not be combined into one system with rooms in which air recirculation is not allowed.

7.2.7 For air heating systems and supply ventilation systems combined with air heating, it should be provided:

- backup circulating pumps for air heaters and backup fans (or electric motors for fans);

- at least two heating units (or two systems). If the fan of one of the two units (systems) fails, it is allowed to reduce the air temperature in the room for the period of repair work below the normative, but not below the allowable air temperature according to 5.2.

7.2.8 Air conditioning and general ventilation systems for rooms without natural ventilation and with permanent occupancy should be provided:

a) for production, administrative and public premises:

- with redundant fans (or redundant electric motors for fans) for supply and exhaust units;

- with at least two supply and two exhaust units with an airflow of at least 50% of the required air change;

- one supply and one exhaust unit with redundant fans (or redundant electric motors for fans);

b) for production rooms connected by openings to adjacent rooms of the same category of explosion and fire hazard and with the release of similar hazards - one supply system without a standby fan and one exhaust system - with a standby fan or electric motor.

7.2.9 Central ventilation systems in public and industrial premises designed to maintain the required air parameters around the clock and all year round should be provided with at least two ventilation units.

If one of the ventilation units fails, at least 50% of the required air flow (but not

less than the air flow required to meet sanitary or explosion and fire safety standards) must be provided.

In this case, it is not allowed to reduce the room temperature, according to 5.2, during the cold period of the year.

If there are technological requirements or according to the design task to maintain the required air parameters, the installation of backup air conditioners or fans, or electric motors (taking into account 7.2.8), pumps, etc. should be envisaged.

Central ventilation systems in the residential premises of apartment buildings with mechanical inducement should be provided with redundant ventilation units, or redundant fans, or with redundant electric motors in the fan sections of ventilation units.

7.2.10 Local exhaust systems of hazard classes 1 and 2 should be provided with one redundant fan (for each system or for two systems), providing the air flow required to maintain the concentration of harmful substances in the room below the MPC, if the fan can not stop the process equipment or the concentration of harmful substances in the room may exceed the MPC during the work shift.

A standby fan should not be provided if a reduction in pollutant concentrations to the MPC can be achieved by the provided emergency ventilation automatically activated in accordance with 11.2.15, e).

7.2.11 Systems of mechanical exhaust general exchange ventilation for premises of categories A and B, as well as in the airlocks at the exits from the premises of categories A and B, should be provided with one reserve fan for each system or one reserve fan for several systems, providing the air flow required to maintain the concentration of flammable gases, vapors or dusts in the premises, not exceeding 10% of the NEQ of gas, steam and dust-air mixtures.

A backup fan may not be provided:

a) if the shutdown of the general ventilation system can stop the process equipment associated with it and stop the release of flammable gases, vapors and dusts;

b) if the room provides for emergency ventilation with an air flow rate not less than necessary to ensure that the concentration of flammable gases, vapors or dusts does not exceed 10% of the NKPR of gas, vapor and dust-air mixtures.

If a back-up fan according to (a) and (b) of this paragraph is not installed, an alarm must be provided.

Local exhausting systems for explosive mixtures should be provided with one standby fan (including ejector units) for each system or for two systems if the process equipment cannot be shut down when the fan stops and the concentration of flammable gases, vapors and dusts can exceed 10% of the NOEL. The standby fan can be omitted if the reduction of combustible concentration in the air of the premises up to 10% of the lower explosive limit can be achieved by the emergency ventilation system automatically switching on in accordance with 12.2.15, e).

7.2.12 Systems of local exhaust of harmful substances or explosive mixtures

should be provided separately from the general ventilation systems.

To the round-the-clock system of general exhaust ventilation, equipped with a standby fan, it is allowed to connect local suction of harmful substances, if cleaning of the air from them is not required.

The general exhaust system of general exchange ventilation and local suction is allowed to provide:

- for one laboratory room of research and production categories B1 - B4, G and D, if the equipment, equipped with local suction, does not form explosive mixtures;
- for the storeroom category A of the operational storage of test substances, provided that a normally open fire damper is installed.

7.2.13 General Exhaust Ventilation Systems for premises of categories B1-B4, G, removing air from the five-meter zone around the equipment containing flammable substances that form explosive mixtures in this area, should be provided separately from other exhaust ventilation systems of these premises.

7.2.14 Systems of local exhaust from technological equipment should be provided separately for substances whose combination can form an explosive mixture or create a more hazardous harmful substances.

Combining local suction of combustible or hazardous substances in the overall system is allowed by the design assignment and the technological part of the design documentation.

7.2.15 Local exhaust systems for combustible substances deposited or condensing in the ducts or ventilation equipment should be provided separately for each piece of equipment in the room; several pieces of equipment, cabinets in one room should be combined into one system according to the design assignment and data of the technological part of the project.

7.2.16 Air perfusion systems for supplying air to workplaces must be separate from systems for other purposes.

7.2.17 Mechanical general ventilation systems should be provided for the premises of the storage categories A, B and B1 - B4 with emissions of combustible gases and vapors. For the premises of A and B category warehouses with a capacity of more than 10 tons it is necessary to provide a backup system of mechanical exhaust ventilation for the required air exchange, placing the local control systems at the entrance.

It is allowed to provide removal of air only from the upper zone systems with natural induction, if these rooms emitted gases and vapors are lighter than air and the required air exchange does not exceed two times in 1 hour.

7.2.18 Systems of mechanical general exhaust ventilation should be provided for rooms of warehouses with the release of harmful gases and vapors, providing a backup system of mechanical exhaust ventilation for the required air exchange and placing a local control systems at the entrance.

It is allowed to provide systems of general ventilation with natural induction in case of release of harmful gases and vapors of hazard classes 3 and 4, if they are lighter than air.

7.2.19 Systems of mechanical general exhaust ventilation should be provided for the premises of categories A and B. Systems with natural stimulation for these rooms should be provided if the explosive flammable substances are lighter than air and the efficiency of the systems is ensured at no wind during the warm period of the year.

7.2.20 For ventilation of pits 0.5 m deep and more and observation ducts with daily maintenance and located in rooms of categories A and B or in rooms that emit harmful gases, vapors or aerosols with a density greater than the air density, it is allowed to use general mechanical exchange ventilation systems.

7.2.21 Ventilation of rooms with HII, not equipped with the system of removal of combustion products into the atmosphere, can be natural or mechanical. For removal of combustion products, general exchange or local ventilation systems can be used. The ventilation system should ensure that the entire volume of combustion products from the GII is removed from the room. The air supply to the rooms with HBIs must be arranged in such a way as to ensure that the supply air to the workplaces does not mix with the combustion products.

7.3 Organization of air exchange

7.3.1 During the cold season in public, administrative and industrial buildings equipped with mechanical ventilation systems, a balance between supply and exhaust air flow should be ensured.

In areas with a design outdoor temperature of minus 40 ° C and below (parameters B) in the cold season in public and administrative buildings (except buildings with wet and wet modes) should provide positive imbalance in the amount not exceeding 0.5 air changes in 1 hour in rooms of height 6 m and less and not more than 3 m^3 / h per 1 m^2 floor in rooms higher than 6 m.

In public and office buildings, a part of the supply air air (not more than 50% of the required air for the serviced rooms) may be supplied to corridors or adjacent rooms, provided that the permissible pressure difference at the door between the room and the corridor is within 20 to 50 Pa.

In public and administrative buildings, as well as in production facilities (except warehouses) of categories B4, G and D, part of the exhaust air (to the extent of not more than one air change per hour) may be removed through overflow grilles from corridors or adjacent rooms, provided that normally open fire dampers are installed in them in accordance with paragraph 7.11.8.

7.3.2 When technically justified in the production buildings during the cold season should provide negative imbalance in the amount not more than 0.5 air changes in 1 hour in rooms of height 6 m and less and not more than 3 m^3 / h per 1 m^2 floor in rooms

of height greater than 6 m.

For rooms in categories A and B, as well as for production facilities that emit harmful substances or strongly pronounced unpleasant odors, a negative imbalance should be provided.

A balance between supply and exhaust air should be maintained for rooms in categories A and B, if they emit gases and vapors lighter than air when the air is removed by natural induction systems.

7.3.3 For clean rooms and air-conditioned rooms, a positive imbalance should be provided if there are no releases of harmful and explosive gases, vapors or aerosols or strongly pronounced unpleasant odors.

7.3.4 The air flow rate to ensure the imbalance in the rooms should be taken:

a) if there is no airlock - at the rate of creating a pressure difference of not less than 10 Pa in relation to the pressure in the protected room (with the doors closed), but not less than 100 m^3 / h per door of the protected room;

b) if there is a tambour lock - equal to the flow rate supplied to the tambour lock.

7.3.5 In the premises of residential, public, administrative and industrial buildings, supply air should be supplied in such a way as to provide the required microclimate parameters within the served or working area.

7.3.6 In residential buildings, supply air should normally be supplied from air diffusers located in the upper zone (mixing ventilation), taking into account Appendix L. In the premises of public and industrial purposes (with excess or lack of heat) can be used both mixing and displacement ventilation (Appendix G).

In public spaces with permanent locations of people is allowed local supply air in the breathing zone (personal ventilation).

7.3.7 It is not allowed to connect additional devices (kitchen hoods with a fan, household fans, etc.) to the general ventilation system in the premises of residential buildings, unless it is provided in the project documentation.

For buildings with gas cooking stoves, it is necessary to provide additional ventilation ducts for kitchen hoods with fan as independent for each kitchen or with the construction of a common prefabricated duct, taking into account 7.11.6.

7.3.8 In rooms with significant moisture in the heat and moisture ratio of 40000 kJ/kg or less should be supplied part of the supply air with a temperature above the dew point temperature of the internal air in areas of possible condensation on the building envelope.

7.3.9 In production rooms, supply air should be supplied to the work area by direct or return flow according to Appendix G.

7.3.10 In rooms with dust emissions, the supply air should be supplied in jets directed downward from the air diffusers located in the upper zone (Appendix G).

7.3.11 In areas with a variable mode of operation (trade and sports halls, production facilities with heat-gas-generating equipment of periodic action, etc.) allowed

to use adaptive ventilation systems with regulation of supply and return air flow by sensors of carbon dioxide and temperature, depending on the actual filling of the room people or loading of technological equipment (ventilation on demand).

7.3.12 Supply air should be directed so that the air does not flow through areas of high contamination into areas of lower contamination and does not interfere with local suction. Supply air should be routed to permanent workplaces if they are located near sources of harmful emissions where local suction is not possible.

7.3.13 Air recirculation is not allowed from:

a) rooms where the outdoor air flow rate is determined by the mass of emitted harmful substances of hazard classes 1 and 2;

b) rooms in the air of which there are pathogenic bacteria and fungi in concentrations exceeding those established by the sanitary and epidemiological supervision authority, or strongly pronounced unpleasant odors;

c) rooms where there are hazardous substances combustible in contact with heated surfaces of the air heater, in front of which there is no air purification;

d) premises of categories A and B (except air and air/heat curtains at exterior gates and doors);

e) laboratory rooms for research and production purposes, in which work is carried out with harmful or flammable gases, vapors and aerosols;

f) rooms of categories B1 - B4, where combustible dusts and aerosols are emitted;

g) five-meter zones around equipment located in rooms of categories B1 - B4, G, if in these zones produced explosive mixtures of flammable gases, vapors, aerosols with air;

i) systems of local exhaust of harmful substances and explosive mixtures with air;

j) vestibule sluices.

7.3.14 Air recirculation is allowed:

a) in production buildings - from local exhaust systems of dust-air mixtures (except explosive dust-air mixtures) after their cleaning from dust;

b) in public buildings - for a group of rooms of the same class of functional fire hazard, as well as one functional purpose (administrative or office, or hotel rooms, etc.) provided that an air disinfection device is installed in the ventilation system, which provides constant disinfection of the supply or return air entering the premises.

7.3.15 Air recirculation is limited:

a) outside of one apartment in an apartment building or a single-family house, a room in a hotel;

b) the limits of one room in public buildings;

c) within a group of public premises of the same functional hazard class (within one fire compartment) with common openings (internal open stairs, escalators, etc.) with a total area of more than 2 m^2 ;

d) the limits of one or more rooms that emit the same hazard class 1, 2, 3 or 4

4 hazardous substances.

7.3.16 Ventilation systems should be installed in areas where the air is the most contaminated or has the highest temperature or enthalpy. When dust and aerosols are emitted in rooms without heat emission, air removal by general ventilation systems should be provided from the lower zone.

In manufacturing facilities with heat and emissions of harmful or flammable gases or vapors lighter than air, the polluted air should be removed from the upper zone in the volume of at least one air change per hour in rooms of height 6 m or less; not less than 6 m^3 / h per 1 m^2 area of the room - in rooms higher than 6 m.

7.3.17 Air intakes for exhaust ventilation systems from the upper zone of the room should be placed:

a) under the ceiling or cover, but not lower than 2 m from the floor to the bottom of the openings - to remove excess heat, moisture and harmful gases;

b) at least 0.4 m from the plane of the ceiling or coating to the top of the openings - to remove explosive mixtures of gases, vapors and aerosols (except mixtures of hydrogen and air);

c) not less than 0.1 m from the ceiling plane or roof to the top of the openings in rooms of 4 m or less, or not less than 0.025 room height (but not more than 0.4 m) in rooms higher than 4 m - for hydrogen-air mixture removal.

7.3.18 Air intake openings for air removal by general ventilation systems from the lower zone should be placed at a level of up to 0.3 m from the floor to the bottom of the openings.

The flow rate of air removed through local suction units placed within the work area should be counted as the removal of air from this area.

7.3.19 Air exchange in parking lots of individual (private) transport is determined by calculations with the average value of the number of entries and exits, respectively, equal to 2% and 8% of the total number of parking spaces. In this case, the concentration of carbon monoxide (CO) should be taken 20 mg/m^3 .

The air exchange in the parking lots for short-term storage in offices and general purpose is determined by the calculation of the maximum values of the number of entries (exits).

In this case, the concentration of carbon monoxide (CO) should be taken depending on the duration of stay of people, but not more than 1 hour, guided by the technological part of the project and GOST 12.1.005.

For in-built underground parking lots, it is recommended that the capacity of the air inlet units be 20% less than the exhaust units for each compartment.

7.3.20 In multi-story parking lots with isolated ramps for each floor should be designed separate supply and exhaust ventilation systems.

It is allowed to design common systems for all parking floors provided they are

assigned to the same fire compartment.

7.3.21 Supply air to the vehicle storage area is recommended to be concentrated along internal passageways.

Air removal from the storage room should be provided from the upper and lower areas of the floor volume equally distributed throughout the room.

Supply and exhaust systems should be operated, as a rule, periodically (according to the room gas sensor).

7.3.22 Ventilation of I&G, TS/RU/RSH, electrical switchboards, premises of low-current systems and auxiliary premises, storerooms located in the fire compartment of the parking lot, as well as technical premises located in the fire compartment of industrial premises and related to them, is allowed to perform air of these premises (if assigned to categories B2-B4), with installation of small exhaust fans in these premises.

At the same time, it is recommended to install filters on the air inlets in the walls of electrical and low-voltage system rooms, and to equip the air outlets and air intakes with a normally open fire damper.

7.3.23 Ventilation of parking lots built into public buildings may be carried out by exhaust air from the general ventilation systems of these buildings (except for the air removed by the ventilation systems of sanitary rooms, cleaning equipment rooms, rooms with harmful and unpleasant smelling substances, etc.). At the same time on the ducts from the general ventilation systems of these buildings should be installed normally open fire dampers in places where they cross the enclosing structures of parking lots, automatically closed in case of fire in the fire compartments of parking lots or public part.

7.4 Supply air supply

7.4.1 The required supply air flow rate (outdoor or a mixture of outdoor and recirculation air) should be determined by calculation in accordance with Annex D and take the larger of the values necessary to ensure hygienic standards or standards for explosion and fire safety, taking into account the effectiveness of ventilation systems and indoor air quality requirements.

Determining the amount of air required to provide the standard parameters of the air environment in the work area by the rate of air exchange is not allowed, except in cases justified by regulations approved in the prescribed manner.

7.4.2 The outdoor air supply to the room should be at least: a) the minimum outdoor air flow rate calculated according to

Appendices C and D.

b) the flow rate of air removed by local exhaust systems, general exchange ventilation, technological equipment, taking into account the normalized imbalance.

7.4.3 When determining the supply air flow rate also must also be taken into account:

- known sources of contaminant release;
- excess heat or cold, which must be removed by means of ventilation;
- the amount of air required to ensure stable gas combustion when using gas-fueled appliances.

The amount of air required to provide the standard parameters of the air environment in the work area should be determined by calculation, taking into account the uneven distribution of harmful substances, heat and moisture in the volume of the premises, in particular in the rooms:

- with heat releases, the calculation is based on excess apparent heat;
- with heat and moisture emissions is calculated by excess apparent heat, moisture, latent heat, taking into account the necessary prevention of condensation on the surfaces of building structures and equipment;
- with the simultaneous release of several harmful substances into the air, the calculation is made for the substance that requires the highest air consumption to ensure its MPC (in the case of unidirectional action of harmful substances, the air consumption is determined for each substance, followed by their summation);
- with simultaneous emission of harmful substances, heat and moisture is calculated for each type of emission, and the calculation results with the highest air flow rate are used for design.

7.4.4 The concentration of harmful substances in the outdoor (atmospheric) air used for ventilation must not exceed the MPC values in the air of populated areas.

If the maximum permissible concentrations in the outdoor air are exceeded, measures must be taken to eliminate the sources of harmful substances or, if they cannot be eliminated, provisions must be made for purification of supply air to the maximum permissible concentrations of pollutants.

7.4.5 The amount of harmful substances, heat and moisture emitted in the premises should be taken according to the technological part of the project, the norms of technological design or process equipment passport.

In the absence of the necessary data should assess the gross emissions of harmful substances, heat and moisture from technological equipment operating at full load in full-scale or laboratory conditions, it is allowed to use the results of field studies at similar facilities or data obtained by calculations, which must be reflected in the project.

7.4.6 The content of harmful substances in the supply air (at the outlet of air diffusers and other air inlets) should be determined by calculation, taking into account the background concentrations of these substances in the location of air intake devices, but not more than 30% of the MAC in the working area air of the premises.

The content of dust in the supply air supplied by mechanical ventilation after appropriate cleaning should not exceed the MAC in the atmospheric air of settlements when it is supplied to the premises.

7.4.7 Systems of outside air supply to one airlock or group of airlocks of industrial

premises of categories A or B, or to machine rooms of elevators of buildings of categories A or B, or to airlocks of premises for ventilation equipment of categories A or B should be provided separately from other systems, with a standby fan for each system.

Systems for air supply to vestibule airlocks of premises of other categories and other purposes should be provided in common with the systems of the premises protected by these vestibule airlocks.

7.4.8 The flow rate of air supplied to airlocks as well as to machine rooms of elevators of buildings of categories A and B in accordance with 7.4.7 should be calculated according to Annex D under the condition of creating and maintaining in them when the doors are closed excess pressure of at least 20 Pa (relative to the pressure in the room for which the airlock is intended), but at least 250 m^3 /h for each airlock.

The flow rate of air supplied to the rooms of machine rooms of elevators in buildings of categories A and B should be determined on the basis of creating a pressure not less than 20 Pa above the pressure in the adjacent part of the elevator shaft.

Difference in air pressure in airlocks or machine rooms elevator compartments and adjoining rooms should not exceed 50 Pa.

7.4.9 The supply of outside air to the vestibule-entrances specified in 7.4.7. air supply to vestibule airlocks (except elevator machinery rooms) should be provided from a separate system or from the general air supply system serving the protected premises of categories A and B, or from the air supply system (without recirculation) serving premises of categories B4 and D, providing a backup fan for the required air exchange for vestibule airlocks, as well as installation of normally open fire dampers to shut off air supply to protected premises of categories A and B or to premises of categories B4 and D in case of fire.

7.5 Outdoor air intakes

7.4.1 Outdoor air intakes, including supply air shafts, shall not be located:

- less than 8 m from places of waste collection, loading and unloading areas, evaporative cooling systems, upper parts of chimneys, places with emissions of other contaminants or odors, from places of exhaust air emissions with the presence of harmful substances or odors;
- on the side of the facade facing the street with heavy traffic; if this condition is not feasible, then the intakes for outside air should be located in the upper part of the building;
- at a distance of less than 5 m from open areas, roofs or walls (outside air intakes, in this case should be arranged and protected so that the air does not overheat during the warm period).

7.4.2 Air intake shafts for supply ventilation systems of buildings can be built-in, attached or freestanding.

When installing outdoor air intake, including from the facade of the building, you

should consider the possibility of cleaning the inner surfaces of prechamber and air intake shafts.

Air intake points to ensure safe operation of ventilation systems should be made at a height of generally not less than 2 m from the ground level or roof of the stylobate with the possibility of access for maintenance personnel. The air intake louvers should be located at an angle of 20° downward, and the velocity in the "live" section should not exceed 2.5 m/s.

For supply-air smoke ventilation systems, it is possible to reduce the distance from the bottom of the outdoor air intake opening to the height of the expected maximum thickness of stable snow cover.

The minimum distance to the bottom of the outdoor air intake device located on the roof or on the site should be taken as 1.5 times the expected maximum thickness of the snow layer. This distance can be less than the specified one, if the formation of the snow layer is prevented, for example, by shields or by heating the roof or by applying other organizational measures with the possibility of cleaning the roof in the air intake area.

If there is a risk of penetration of water in any form (snow, rain, fog, etc.) or dust (including leaves), the airflow rate at the inlet to the outdoor air intake device in the live section is recommended to take no more than 2 m/s;

In areas of sandstorms and intensive transport of dust and sand behind the intake opening should be provided with chambers for the deposition of large particles of dust and sand and place the bottom of the opening at least 3 m from ground level.

Protection of intake devices from contamination by suspended impurities of plant origin should be provided by the design task.

7.4.3 Within a single fire compartment common outside air intakes should not be provided:

a) for the supply systems of general exchange ventilation, the equipment of which is not allowed to be placed in one room for ventilation equipment according to 7.10.11 - 7.10.14, 7.10.18;

b) for supply systems of general exchange and smoke ventilation.

Within a single fire compartment, common outdoor air intakes are permitted for general exchange supply ventilation systems, including underground parking lots (except for systems serving areas of categories A, B and C1, warehouses of categories A, B, C1 and C2, as well as rooms with local exhaust systems for explosive mixtures and systems under 7.2.13) and for fresh smoke ventilation systems provided that normally open fire dampers are installed on the ducts of general exchange ventilation systems in places

For these valves should be provided with automatic control of the integrity of power supply and control lines, the state of the end position of the flaps (blades), with the issuance of a signal about the failure to the control room. Automatic translation to the closed position of the flaps (blades) of such valves should be carried out by de-energizing

electrical consumers of general ventilation systems, which include the installation of such valves.

7.4.4 Common outdoor air intakes should not be provided for general ventilation supply systems serving different fire compartments. The horizontal or vertical distance between intakes located in adjacent fire compartments must be at least 3 m.

Common intakes for systems serving different fire compartments may be provided for general ventilation systems, including underground parking lots (except for systems serving production facilities of categories A, B and C1, warehouses of categories A, B, C1 and C2, as well as rooms with local exhaust systems of explosive mixtures and systems according to 7.2.13), provided that fire dampers with fire resistance limit according to fire safety rules are installed, ensuring compliance with the requirements of the Law of the Kyrgyz Republic

a) normally open - on the ducts of the supply systems of general exchange ventilation in the places where they cross the enclosures of the room for ventilation equipment, if the installations of these systems are located in a common room;

b) normally open - in front of the outside air dampers of all air handling units placed in different rooms for ventilation equipment.

It is allowed to provide common outside air intakes for the general ventilation systems (except for systems serving production facilities of categories A, B and C1, warehouses of categories A, B, C1 and C2 as well as rooms with local exhaust systems of explosive mixtures and systems according to 7.2.13) and for the systems of fresh smoke ventilation of adjacent fire compartments provided that fire protection valves are normally open on the ducts of general ventilation supply systems in places where they cross room enclosures These dampers shall be equipped with automatic control of the integrity of power supply and control lines, and of the end position of the dampers (shutters) and an alarm signal to a control room. Automatic translation in the closed position of the dampers (wings) of such valves should be carried out by de-energizing the electrical consumers of the general ventilation systems, which include the installation of such dampers.

7.4.5 Outdoor air intakes and exhaust air intakes

devices for removal of exhaust air of general ventilation systems to the atmosphere may be placed on the same facade with windows that do not open during operation at the level of technical or service floor, taking into account 7.6.1, 7.6.4.

7.4.6 When placing outdoor air intakes of supply smoke ventilation systems and combustion product emissions of exhaust smoke ventilation systems, these devices should be placed on opposite facades of the building. If it is not possible to place them on opposite (or different) facades, it is allowed to place them on a common facade (including one) if the following conditions are simultaneously met:

- the emission of combustion products in the "live" section should be provided at a speed of at least 20 m/s at an angle of not more than 30° down and / or sideways (in relation to the horizon line);
- the distance between such devices must be at least 5 m (from edge to edge).

Such devices shall be equipped with smoke detectors whose control signals are used to shut down the smoke ventilation system, including the closing of normally closed fire dampers in this system.

In all cases, outside air intakes for smoke ventilation systems located on the facade must be provided at a distance of at least 15 m vertically (from edge to edge) and at least 5 m horizontally (from edge to edge) from window openings with glazing in non-fireproof version, except for meeting these conditions when they are located in the lower part of the fire compartment served.

7.4.7 When using individual supply and exhaust systems, including wall supply and exhaust recuperative ventilation devices, the minimum distance between the supply and exhaust openings of the devices is not regulated and is taken in accordance with the passport of the device.

7.5 Air emissions into the atmosphere

7.6.1 The air discharged into the atmosphere from local exhaust systems and general ventilation of production facilities, containing pollutants (hereinafter - the dust and gas-air mixture), should be purified. In addition, it is necessary to dissipate residual quantities of harmful substances in the atmosphere. Concentrations of harmful substances in the atmosphere from ventilation emissions of this facility, taking into account the background concentrations of other emissions must not exceed:

a) maximum permissible maximum single concentrations of harmful substances in the atmospheric air of populated areas or 0.8 MPC in the sanitary protection zone of resorts, large resorts, recreation centers and recreation areas of cities or smaller values established for the facility. For harmful substances with unspecified maximum single concentrations as MPC should be taken the average daily maximum permissible concentrations of harmful substances in the atmospheric air of settlements;

b) 0.3 MPC for the working area of production facilities in the air entering the

premises of production and administrative and residential buildings through intake devices, open windows and openings used for air intake.

7.5.1 Cleaning of emissions of dust and air mixtures from systems with natural inducement, as well as from systems of small power sources with mechanical inducement is not provided if the requirements are met

7.6.1 or if emissions treatment is not required by the design documentation.

7.6.3 Emissions of dust and air mixtures from ventilation systems of industrial premises with mechanical inducement should be provided through pipes and exhaust air shafts without umbrellas, vertically upwards from the systems:

(a) General exchange ventilation from rooms of categories A and B or from systems that remove hazardous substances of hazard classes 1, 2;

b) local suction of harmful and foul-smelling substances and explosive mixtures.

7.6.4 Emissions of dust and air mixtures into the atmosphere from ventilation systems of industrial premises should be placed according to the calculation or at a distance of at least 10 m horizontally or 6 m vertically from outdoor air intakes if the horizontal distance is less than 10 m. In addition, emissions from local exhaust systems of harmful substances should be placed at least 2 m above the roof of the higher part of the building if the distance to its protrusion is less than 10 m.

Emissions from the emergency ventilation system should be located at a height of at least 3 m from the ground to the bottom edge of the hole. Dissipation into the atmosphere of hazardous substances from emergency ventilation systems should be provided using data from the technological part of the project.

7.6.5 Distance from the sources of emissions of local exhaust systems of explosive steam-gas-air mixture to the nearest point of possible ignition sources (sparks, gases with high temperature, etc.) l_z , m,

should be taken, at least

$$lz \ 4D \ \frac{q}{q} \ 10, \qquad (1)$$

z

where D is the diameter of the source mouth, m;

q - concentration of combustible gases, vapors, dusts in the emission mouth, mg/m^3 ;

q_z - concentration of combustible gases, vapors and dusts equal to 10% of their lower flame spread concentration limit, mg/m^3 .

7.6.6 Emissions from exhaust ventilation systems should be arranged separately if at least one ventilation stack or exhaust shaft can deposit flammable substances or if explosive mixtures can form when emissions are mixed.

It is allowed to connect these emissions into one ventilation stack or exhaust shaft, providing vertical sections with fire resistance limit of EI 30 from the point of connection of each duct to the mouth.

7.6.7 General exhaust devices for systems serving different fire compartments may be provided for general ventilation systems (except systems serving production facilities of categories A, B and C1, warehouses of categories A, B, C1 and C2, as well as rooms with local exhaust systems for explosive mixtures and systems according to 7.2.12 – 7.2.15), subject to the installation of fire dampers with fire resistance rating according to fire safety rules, ensuring compliance with the requirements of the Law of the Kyrgyz Republic "On Fire Safety" and these construction standards.

7.6.8 The distance between the openings for air discharge from the general ventilation systems located in different fire compartments must be at least 3 m horizontally or vertically.

7.6.9 Placement of exhaust shafts on the territory with emissions of gas-air mixtures at concentrations not exceeding the MPC for populated areas, it is recommended to provide at least 15 m to general education organizations, pre-school educational organizations, medical organizations, residences and recreation areas.

7.6.10. Ventilation emissions from underground parking lots located under residential and public buildings shall be arranged 1.5 m above the roof ridge of the highest part of the building. For a complex of buildings with a common underground parking lot it is allowed to arrange the emission at 1.5 m above the roof ridge of another building at a distance of not less than 15 m from the tallest building in the complex or at the same distance between adjacent buildings.

7.6.11 Ventilation emissions from rooms intended for

gas-using equipment should be arranged above the roof, to a height that ensures safe dispersion conditions, but not less than 0.5 m from the level of the adjacent roof.

7.6.12 It is allowed to discharge exhaust air from the technical premises of the residential building (ITP, TS/RU/RSH, control rooms and switchboards) located in the underground parking lot into the volume of the parking lot.

7.6.13 The discharge of air to the facade of the building from the exhaust systems of general exchange ventilation should be carried out taking into account the following requirements:

- the distance from the air extraction device to the adjacent buildings must be at least 8 m;

- The distance from an air extraction device which does not contain harmful substances or odors must be at least 2 m to an outdoor air intake device located on the same wall; if possible, the outdoor air intake device should be lower than the air extraction opening.

7.6.14 The velocity of the exhaust air in the discharge device (in the live section) should not exceed 2.5 m/s when discharging air on facades with windows and
5 m/s at air discharge on the unattended roof with acoustic calculations (if necessary).

Emission height and air flow rate in the presence of foul-smelling substances or contaminants in the exhaust air must be determined by calculations of dispersion in the atmosphere to regulatory values.

7.6 Emergency ventilation

7.6.1 Emergency ventilation for rooms in which there may be a sudden influx of large amounts of harmful or flammable gases, vapors or aerosols, should be provided in accordance with the requirements of the technological part of the project, taking into account the incompatibility in time of accidents of technological and ventilation equipment.

The air flow rate for emergency ventilation should be taken according to the technological part of the project.

7.6.2 Emergency ventilation in the premises of categories A and B should be provided with mechanical inducement.

If the temperature, category and group of explosive mixture of flammable gases, vapors and aerosols do not meet the specifications of explosion-proof fans, the emergency exhaust ventilation systems should be provided with ejector units according to 7.9.3 for buildings of any storey. For single-storey buildings which, in case of an accident, receive

combustible gases or vapors with a density less than the air density, it is allowed to accept the supply ventilation with mechanical inducement according to 7.9.4 for displacement of gases and vapors through aeration lanterns, shafts and deflectors.

7.6.3 Emergency ventilation of industrial premises of categories B1-B4, D and D should be provided with mechanical inducement; emergency ventilation with natural inducement is allowed provided the required air flow rate at the design parameters B during the warm period of the year.

7.6.4 For emergency ventilation should be used:

a) main general exchange ventilation systems with redundant fans, as well as local exhaust systems with redundant fans that provide the air flow required for emergency ventilation;

b) the systems specified in list a) of this paragraph and additionally the emergency ventilation systems for the missing air flow rate;

c) only emergency ventilation systems, if the use of basic systems is impossible or impractical.

7.6.5 Exhaust devices (grilles or spigots) for removal of gases and vapors entering the room by emergency ventilation systems should be placed in the following areas:

a) in the working area - when gases and vapors with a density greater than the density of air in the working area come in;

b) in the upper area - when gases and vapors with a density less than the density of air in the working area come in.

7.6.6 To compensate for the flow of air removed by emergency ventilation, use:

a) general exchange supply ventilation systems with redundant fans that provide the necessary airflow;

b) the systems specified in list a) of this paragraph and additionally the special air supply ventilation systems for the missing air flow rate;

c) special air supply systems with mechanical or natural induction for the required air flow rate;

d) the inflow of outside air through automatically opened openings.

7.6.7 Emergency ventilation to prevent the formation of explosive gas, vapor and dust-air mixtures should be turned on by the signal of the gas analyzer, which is triggered when the concentration reaches 10% of the NKPR.

7.6.8 The rate of air exchange created by emergency ventilation must be calculated, at which the concentration of explosive gas in the room does not exceed 50% of the NKRP.

7.6.9 Emergency ventilation according to 7.7.7 must have a standby fan and be supplied with power according to the first category of power supply reliability.

7.6.10 When the emergency ventilation systems are triggered, an alarm should be provided, which should be accompanied by light and sound signals.

7.7 Air curtains

7.7.1 Air and air/heat curtains should be provided:

a) at constantly open open openings in the outer walls of the premises, as well as at the gates and openings in the outer walls, opening more than five times or not less than 30 minutes per shift, in areas with a design temperature of outside air minus 8º C and below (parameters B);

b) at the exterior doors of the lobbies of public and administrative and domestic buildings - depending on the calculated temperature of the outside air (parameters B) and the number of people passing through the doors during 1 hour:

from minus 8 ºC to minus 20 ºC - 200 people and
more; from minus 20 ºC to minus 40 ºC - 100
people and more; below minus 40 ºC - 50 people
and more;

c) at openings, doors and gates of premises with special technological requirements according to the design task (wet mode, prevention of air overflow, rooms with air conditioning, buildings of high energy efficiency class, etc.).

7.7.2 Air and air/heat curtains at exterior openings, gates and doors should be calculated taking into account the wind pressure. The calculation is carried out for the conditions of the outside air temperature (parameters B) and wind speed corresponding to parameters B, but not more than 5 m/s.

7.7.3 The temperature of the air supplied by the air curtains should be taken according to the calculation, but not more than 50 ºC at the doors and not more than 70 ºC at the gates and openings.

7.7.4 Air velocity from the air diffusers of air and air/heat curtains should be taken by calculation, but not more than 15 m/s at the doors and 40 m/s at the gates and openings.

7.7.5 The calculated temperature of the mixture of air entering the room through exterior doors, gates and openings protected by air and air-thermal curtains should be taken at least, ºC:

18 - for the lobbies of public buildings;

12 - for production facilities for light work, work of moderate severity, and for the lobbies of residential and office buildings;

5 - for industrial premises with heavy work and no permanent workplaces at a distance of 6 m or less from doors, gates and openings.

7.7.6 If the calculated temperature of the mixture of air entering the room through the opening is less than the calculated temperature of the air in the room, the additional heat load for heating the incoming air should be taken into account.

7.7.7 For gates and permanently open apertures in the outer walls of the premises, air and air/heat curtains of the cut-off type should be provided to reduce the incoming outside air. It is allowed to use air curtains without heating of supply air, as well as air and heat curtains with partial heating of supply air.

7.7.8 Air and air/heat curtains must cover the entire area of the protected aperture, prevent local breakthroughs of outside air, and provide the required microclimate conditions at permanent workplaces.

7.7.9 The aerodynamic, thermal and acoustic characteristics of factory-made air and air/heat curtain units should be determined by testing. Tests and adjustments of air and air/heat curtains shall be made to ensure that the actual performance complies with the design characteristics

7.7.10 To maintain the protective properties of the air and air-heat curtain during the entire heating period, as well as to reduce energy costs, it is necessary to provide automatic adjustment of air flow rate and heat output of the curtain in accordance with changes in the parameters of the external climate and technological mode of the room.

7.8 Equipment

7.8.1 Fans, air conditioners, supply chambers, air heaters, heat recovery units, dust collectors, filters, valves, sound attenuators, etc. (hereinafter - the equipment) should be selected according to the resistance of the ventilation network at the chosen speed of air movement in it and the calculated air flow rate, taking into account leakage and losses through the leaks:

a) in the equipment - according to the technical characteristics of the equipment or according to the calculation (according to the tightness class B);

b) in the air ducts of exhaust and supply systems b) in the air ducts of air-vent and air-exhaust systems.

Air suction and leakage through leaking fire dampers

should be taken according to these building standards (Appendix M).

7.8.2 To protect against water freezing in the tubes of air heaters you should:

a) Provide for the installation of circulating pumps in the circuit of air heaters for mixing return water from the air heater;

b) if there are no circulating pumps in the circuit of air heaters, justify the speed of water in the pipes by calculation or take at least 0.12 m/s at the design temperature of the outside air (parameters B) and at 0 °C; the reserve of heating surface of the selected air heater must not exceed the calculated one by more than 10%;

c) when using water steam as a coolant, condensate traps shall be placed at least 300 mm below the air heater nozzles from which condensate flows, and condensate removal from condensate traps shall be provided by gravity to the collection tanks.

7.8.3 Equipment in explosion-proof design should be provided:

a) when it is placed in rooms of categories A and B or in the ducts of systems serving these rooms;

b) for systems of general ventilation, air conditioning and air heating (including air-air heat recovery units) and smoke ventilation of premises of categories A and B;

c) for exhaust ventilation systems specified in 7.2.13; d) for

local exhaust systems for explosive mixtures.

If the temperature, category and group of explosive mixture of combustible gases, vapors, aerosols, dusts with air do not meet the specifications of explosion-proof fans, in general ventilation exhaust systems or local exhaust systems should be provided with ejector units. In systems with ejector units, fans, blowers or compressors in the conventional version should be provided if they operate in external air.

Equipment in the conventional design should be provided for local exhaust systems, located in areas of categories B1 - B4, G and D, removing steam, gas and air mixtures, if, in accordance with the standards of technological design eliminated the possibility of forming these mixtures of explosive concentrations during normal operation or in case of failure of technological equipment.

7.8.4 ipment of supply ventilation, air conditioning and air heating systems for premises of categories A and B, as well as air-air heat recovery units for these premises using heat

The air from rooms of other categories (except categories A, B, B1, B2) placed in rooms for ventilation equipment may be accepted in the normal version, provided that explosion-proof check valves are installed according to 7.10.11.

7.8.5 Air treatment should be provided to ensure the required indoor air quality. Filters should be selected taking into account their service life, dust capacity of filters and air quality requirements for heat exchange equipment. To increase the service life of heat-exchange equipment (air heaters, air coolers and recuperators) in industrial and urban areas, two-stage air purification in filters should be provided.

7.8.6 Dust collectors and filters (hereinafter referred to as "dust collectors") should be used to clean the explosive dust-air mixture from combustible substances:

a) in dry cleaning - in explosion-proof version with devices for continuous removal of captured dust;

b) for wet cleaning (including foam cleaning) - in explosion-proof version; in case of technical justification it is allowed to use in normal version.

7.8.7 Supply air air diffusers should be accepted:

a) in the case of air heating, ventilation and air conditioning - with devices for controlling the direction and flow of air;

b) for perfuming workplaces - with devices for adjusting the flow rate and direction of air flow in the horizontal plane at an angle up to 180 ° and in the vertical plane - an angle of up to 30 °.

7.8.8 In the systems of supply and exhaust ventilation of rooms where gas appliances are located, measures should be taken to prevent the possibility of their complete closure.

7.8.9 Supply air diffusers and exhaust air diffusers may be made of combustible materials, provided that the requirements of fire safety regulations are met.

7.8.10 Heat exchangers and sound attenuators shall be made of non-combustible materials. For heat-exchange (internal) surfaces of heat exchangers it is allowed to use materials of flammability group G1.

7.9 Equipment placement

7.9.1 Equipment should be placed in the room for ventilation equipment (ventilation chambers) directly in the fire compartment, which includes serviced and (or) protected rooms. Size

ventilation chambers of supply or exhaust ventilation should be taken into account the possibility of installation, repair and dismantling work, as well as maintenance of equipment.

According to the design task it is allowed to install the equipment: a) in the serviced room, taking into account 7.10.2;

b) on the roof and outside the building of the appropriate climatic version (under design parameters B) and outdoor placement of equipment according to GOST 15150.

When installing equipment on the roof, it is necessary to provide fencing to protect against access by unauthorized persons.

7.9.2 Equipment (except for air and air heat curtains with recirculation and without recirculation air) may not be placed in the serviced areas of warehouses categories A, B, B1 - B3.

Equipment in the premises of the warehouses of categories B2, B3 and B4 can be placed under the condition that:

- the electrical equipment has a degree of protection IP54;
- Warehouses are equipped with an automatic fire alarm system, which disables ventilation equipment in case of fire.

7.9.3 Equipment with an air flow rate of 5 thousand meters^3 / h and less is allowed to be installed with the requirements of 7.10.2 openly and in volume behind the false and suspended ceilings of serviced rooms, as well as behind the false and suspended ceilings of corridors of the floor served, provided the installation (except rooms within one apartment) of normally open fire dampers in places where ducts cross the wall separating the corridor and serviced room. The installation of these dampers is not required for rooms with doors, the fire resistance rating of which is not regulated.

Individual equipment for ventilation systems in apartments in apartment buildings may not be placed in common areas and corridors between apartments.

7.9.4 Equipment of systems of rooms of categories A and B, as well as equipment of systems of local suction of explosive mixtures can not be placed in the basement.

7.9.5 Equipment of emergency ventilation systems and local exhaust systems may be placed in the premises they serve, provided that the requirements of regulatory documents on fire safety under the Law of the Kyrgyz Republic "On Fire Safety" are met.

7.9.6 Dust collectors and filters for dry cleaning of explosive

of the dust-air mixture should be placed in front of the fans.

7.9.7 Dust collectors for dry cleaning of explosive dust-air mixtures should be placed outside the production buildings openly at a distance of at least 10 m from the walls or in separate buildings together with fans.

Dust collectors for dry cleaning of explosive dust-air mixture should be placed together with fans in separate rooms for ventilation equipment of production buildings (except basements):

- without devices for continuous removal of the captured dust at an air flow rate of 15 thousand m^3 /h and less and the mass of dust in the bunkers and containers with a capacity of 60 kg or less;

- with a device for continuous removal of captured dust.

7.9.8 Dust collectors for dry cleaning of flammable dust-air mixture should be placed:

a) outside buildings of fire resistance levels I and II directly at the walls if there are no window openings at least 2 m horizontally from the dust collectors throughout the building height or if there are windows with double-framed metal windows with reinforced glass glazing or glass-block filling that cannot be opened; if windows can be opened, dust collectors must be located at least 10 m from the building walls;

b) outside buildings of III and IV degrees of fire resistance at a distance of at least 10 m from the walls;

c) inside buildings in separate rooms for ventilation equipment together with the fan and other dust collectors of flammable dust-air mixtures:

- in the basement premises under the condition of mechanized continuous removal of combustible dust or its manual removal, if the mass of accumulated dust in bins or other closed containers in the basement room does not exceed 200 kg;

- in industrial premises (except for premises of categories A and B) at air flow rate not more than 15 thousand m^3 / h, if the dust collectors are interconnected with the process equipment.

Filters for purification of combustible dust and air mixtures in production facilities should be installed if the concentration of dust in the purified air entering directly into the room where the filter is installed does not exceed 30% of the MPC of harmful substances in the air of the working area.

7.9.9 Dust-proof chambers for explosive and fire-hazardous dust-air mixture are not allowed.

7.9.10 Dust collectors for wet dust-air mixture cleaning should be placed in heated rooms together with fans or separately from them. Dust collectors can be placed in unheated rooms or outside the buildings.

When placing dust collectors (for dry or wet cleaning of dust/air mixtures) in unheated rooms or outside buildings, it is necessary to provide measures to protect against freezing of water or condensation of moisture in the dust collectors.

7.9.11 Supply ventilation, air conditioning and air heating system equipment (hereinafter referred to as supply system equipment) serving rooms in categories A and B shall not be placed in a common room for ventilation equipment along with equipment of exhaust systems, as well as supply and exhaust systems with air recirculation or air-air heat recovery units.

Explosion-proof check valves should be installed on the ducts of air supply systems with conventional equipment serving rooms of categories A and B, including administration, rest and heating rooms located in these rooms where the ducts cross the room enclosures for ventilation equipment.

7.9.12 The equipment of air recirculation supply systems serving rooms of categories B1, B2, B3 and B4 must not be placed in common rooms for ventilation equipment together with the equipment of systems for rooms of other categories of explosion hazard.

7.9.13 The equipment of the air supply systems serving the living quarters may be placed in the common room for ventilation equipment together with the equipment of the air supply systems serving the public rooms.

7.9.14 Equipment of exhaust systems of industrial, administrative and public buildings, removing air with a pungent or unpleasant odor (from public restrooms, smoking rooms, etc.), it is not allowed to place in the common room for ventilation equipment along with equipment for supply systems.

7.9.15 The equipment of general exhaust ventilation systems serving rooms in categories A and B should not be placed in the common room for ventilation equipment together with equipment for other systems.

Equipment of general exhaust ventilation systems for rooms

categories A and B may be placed in a common room for ventilation equipment together with the equipment of local exhaust systems of explosive mixtures without dust collectors or with wet dust collectors, if the ducts exclude deposits of flammable substances.

7.9.16 The equipment of exhaust systems from rooms of categories B1, B2 and B3 should not be placed in a common room with the equipment of exhaust systems from rooms of category D.

7.9.17 Equipment of local exhaust systems for explosive mixtures should not be placed together with equipment of other systems in the common room for ventilation equipment, except as specified in 7.10.15.

7.9.18 Air-air heat recovery units, as well as equipment of exhaust systems, the air heat of which is used to heat (cool) the supply air (including in residential and hotel buildings, where the removal of air from living rooms through kitchens and toilets is provided) may be placed in one room for ventilation equipment supply and supply and exhaust interlocked systems that serve residential, public and administrative and domestic buildings, subject to 7.10.12 - 7.10.17, 7.10.24.

Air removal from living rooms and hotel rooms with bathrooms should be provided through the bathrooms with the device of overflow grilles in the lower part of the bathrooms or through a gap between the door and the floor at least 2 cm.

In central ventilation and air conditioning systems of residential buildings and health care facilities, primarily plate cross-flow recuperators should be used.

For public buildings it is allowed to use rotary recuperators with blowing sector, which prevents the flow of exhaust air into the supply air path, and install additional filters and decontaminators (if necessary) after the recuperator, in the supply air path after the installation or at the entrance to the serviced rooms.

7.9.19 oms for ventilation equipment of general exchange ventilation systems and local exhaust systems should be referred to the explosion and fire hazard:

a) to the category of rooms they serve, if the equipment of general ventilation systems of production buildings is located in them;

b) category D, if they contain fans, blowers and compressors supplying outside air to ejectors located outside these premises;

c) to the category of rooms from which air is taken by fans,

blowers and compressors to feed the ejectors;

d) category A or B, if they contain equipment of local exhaust systems that remove explosive mixtures from process equipment. Premises for equipment of local exhaust systems of explosive dust-air mixtures with wet dust collectors, placed in front of the fans, it is allowed, if justified, to refer to the premises of category D;

e) category D, if they contain equipment of exhaust systems for general ventilation of residential, public and administrative and household premises.

Premises for equipment extraction systems serving several rooms of different categories of explosion and fire hazard should be assigned to the more hazardous category.

7.9.20 Premises for ventilation equipment of supply ventilation systems according to the fire and explosion hazard should be referred to:

a) to category B1, if they contain units (filters, etc.) with oil with a capacity of 75 liters or more in one of the units;

b) to categories B1, B2, B3, B4 or D if the system operates with recirculation of air from premises of categories B1, B2, B3, B4 or D respectively, except when the air is taken from premises where no flammable gases and dust are emitted or where foam or wet dust collectors are used to clean the air from dust;

c) to categories B1, B2, B3, B4, if the room for ventilation equipment are placed exhaust units serving rooms of categories B1, B2, B3, B4, respectively;

d) to the category of rooms, the heat of exhaust air from which is used in the air-air heat recovery units, which are placed in the room for equipment of supply systems;

e) to category G, if the premises serviced by the systems contain gas-fueled heat generating equipment;

f) to category D - in other cases.

Premises for equipment supply systems with recirculation, serving several rooms of different categories of explosion and fire hazard, should be assigned to the more hazardous category.

7.9.21 Rooms for ventilation equipment should be located directly in the fire compartment in which the serviced and (or) protected rooms are located.

In buildings of I and II degree of fire resistance, rooms for ventilation equipment may be provided outside the serviced (protected)

of the fire compartment:

a) directly behind a fire barrier (fire wall or fire slab) at the boundary of such fire compartment

– when installing normally open or normally closed fire dampers on the ducts of general ventilation systems or smoke ventilation systems, respectively, at the intersections of the specified fire barrier;

b) at a distance from the border of this fire compartment - with a similar installation of fire dampers and the design of ducts in sections from the fences of the room for ventilation equipment to the crossed fire barrier with fire resistance limits not less than the fire resistance limit structures of this barrier.

7.9.22 The fire resistance limits of the enclosing building structures of the rooms for ventilation equipment of general exchange ventilation systems located in the fire compartment, where the rooms serviced by these systems are located, shall be at least EI 45. Doors of such rooms (with the exception of rooms for ventilation equipment of general exchange ventilation systems referred to category D) shall be fireproof type 2.

The enclosing structures of the rooms for ventilation equipment shall be made with fire resistance limits not less than the fire resistance limits of the fire barrier separating the fire compartment to be served (protected). In these rooms it is allowed to install equipment of supply or exhaust general exchange ventilation systems in a limited list in accordance with the Law of the Kyrgyz Republic "On Fire Safety" or supply or exhaust anti-smoke ventilation systems serving or protecting the premises of different fire compartments. The doors of such compartments shall be fire rated type 1.

When storerooms according to 7.3.22 are separated into a separate block, rooms for ventilation equipment, provided in the fire compartment of the storeroom block, should be separated by fire walls and (if necessary) by fireproof ceilings.

7.9.23 Premises of ventilation chambers must be equipped with ventilation in the volume plus 2 multiples for supply and minus 1 multiples for exhaust ventilation chambers. When supply and exhaust equipment are located together, the air exchange rate should be 1.5. It is permitted to use equipment located in the ventilation chambers with the longest operating time for the rooms served.

7.10 Air ducts

7.10.1 Ventilation duct networks should be provided from standardized standard parts.

Duct coatings must be resistant to the transported and the environment.

Air ducts made of chrysotile cement (asbestos cement) structures shall not be used in supply ventilation systems.

Air ducts in the construction version of chrysotile cement (asbestos cement) structures and concrete blocks are not allowed to use in apartment buildings over 50 m in height.

Thickness of sheet steel for metal ducts should be taken according to Appendix K. The thickness of sheet steel for the construction of ducts with the rated fire resistance rating should be at least 0.8 mm, taking into account the tolerances established for rolled steel sheets.

7.10.2 Ducts with the rated fire resistance rating, as well as thermal protection and fire protection coatings of these ducts should be made of non-combustible materials.

It is not allowed to use self-adhesive flame retardant coatings, fixing flame retardant coating of self-adhesive foil tapes, inter-flange seals and sealants of flammability group G1 or higher in the ducts with the rated fire-resistance limit.

7.10.3 Air ducts made of non-combustible materials should be provided:

a) for local exhaust systems of explosive and flammable mixtures, emergency ventilation and transporting air with a temperature of 80 °C and above;

b) for transit sections or collectors of ventilation systems of residential, public, administrative and industrial buildings;

c) for sections of air ducts within rooms for ventilation equipment, as well as technical floors, attics, basements and cellars.

The use of used profiles, sheets, strips and other metal structures for the manufacture of ducts is not allowed.

7.10.4 Air ducts made of combustible materials (with a flammability group not lower than G1) may be provided within the premises served.

7.11.5 Flexible inserts in fans, except for local exhaust systems of explosive mixtures, emergency ventilation and moving gas mediums with a temperature of 80°C and above, can be made of combustible materials. It is not allowed to use flexible inserts made of combustible materials when connecting to the fans of ducts with the rated fire-resistance limits.

7.11.6 In order to prevent the penetration of combustion products (smoke) into the premises during a fire, additional devices (air closures, fire dampers, etc.) must be provided on the air ducts of general ventilation, air heating and air conditioning systems, taking into account the functional purpose of the premises, class of functional fire hazard and categories of fire and explosion hazard of the premises.

Combination of the warm attic ducts of general exhaust ventilation may be provided in residential, public (except for buildings of medical organizations) and administrative and domestic buildings, subject to 7.1.1, 7.1.2, 7.1.4, except ducts from the premises intended for the installation of gas boilers.

7.11.7 Installation of check valves should be provided to protect (when ventilation is not working) against the flow of harmful substances of hazard classes 1 and 2 from one room to another, placed on different floors, if the flow of outdoor air in these rooms is determined by the condition of assimilation of harmful substances.

7.11.8 Openings for air flow should be provided in fire partitions separating public, administrative or industrial premises (except for warehouses) of categories B4, G and D from corridors, provided that normally open fire dampers are installed in the openings; fire dampers may not be installed in premises for which fire resistance limit is not regulated for doors.

7.11.9 Conditions of laying of transit ducts and collectors of ventilation systems of any purpose in one fire compartment and fire resistance limits of these ducts and collectors should be provided along the entire length from the points of intersection of the enclosing building structures of served premises to the premises for ventilation equipment in accordance with fire safety rules, ensuring compliance with the requirements of the Law of the Kyrgyz Republic "On Fire Safety" and Appendix H.

7.11.10 The tightness classes of air ducts must comply with Appendix M.

In order to prevent unnecessary energy losses and to maintain the required air flow, the permissible leakage in ventilation and air conditioning systems should not exceed 10%.

7.11.11 Transit air ducts of systems serving the premises may not be routed through the apartments of residential apartment buildings

other purposes.

It is allowed to remove combustion products from the blocks of storerooms, loading rooms, garbage storage rooms and other technological rooms,

7.11.12 It is not allowed to lay ducts:

a) transit - through stairwells, airlocks, elevator halls (except for the ducts of smoke ventilation systems serving these stairwells, airlocks and elevator halls), through the premises of civil defense protective structures;

N o t e - It is allowed to install air ducts of general ventilation systems, as well as supply smoke ventilation systems through vestibules, elevator halls and stairwells according to clause 9.18.

b) systems serving production facilities of categories A and B, and systems of local suction of explosive mixtures - in basements and underground ducts;

c) pressure sections of local exhaust systems of explosive mixtures, as well as harmful substances of the 1st and 2nd hazard classes or unpleasant smelling substances - through other rooms.

7.11.13 Gas and flammable piping, cables, electrical wiring, conductors and sewer lines may not be placed inside or outside the ductwork at distances of less than 100 mm from the duct walls. It is not allowed to cross the ducts with these communications and other ducts. It is not allowed to lay pipelines of domestic and industrial sewage in the shafts with the ducts of ventilation systems.

N o t e - It is allowed to install cable-conductor products at a distance of less than 100 mm from the walls of the ducts if one of the conditions is met:

- ensuring the fire resistance limit of air ducts at least EI 30 or separation of air ducts with non-combustible materials (screens);
- use of flame-retardant cable products.

7.11.14 Air ducts of general exhaust systems and systems of local suction of air with combustible lighter air gases should be provided with a lift of at least 0.005 in the direction of movement of gas-air mixture.

7.11.15 Ducts in which moisture or other liquids can settle or condense should be made with a slope of at least 0.005 in the direction of air movement and provide for drainage.

7.11.16 In apartment buildings, air duct systems should be made with air gates (satellites) - on floor collection ducts, as well as on air intake devices and air supply devices in places where they are connected to a vertical or horizontal collector (including for bathrooms, washrooms, showers and kitchens of these

buildings).

The geometric and structural characteristics of air closures (satellites) must ensure that in the event of fire the spread of combustion products from collectors through floor collection ducts, as well as through air intake devices and air supply devices to rooms on different floors is prevented. The length of the vertical section of the air duct of the air shutter (satellite) shall be not less than 2 m.

Vertical collectors with air closures (satellites) may be connected to a common horizontal collector located in the attic or technical floor without the installation of normally open fire dampers.

7.11.17. In multi-family residential buildings it is not allowed to lay prefabricated exhaust ducts with connection of apartment branches in inter-apartment corridors without a satellite device. The design of the ventilation system shall exclude the flow of air from one apartment to another.

It is allowed to install supply distribution ducts in the inter-apartment corridor to distribute the supply air to the apartments' rooms under the condition that fire dampers are installed at the points where the ducts cross the enclosing structures of the apartments and at the point of connection to the prefabricated supply duct.

7.11.18 In multi-storey residential and public buildings, solid fuel fireplaces are allowed provided that each fireplace is connected to an individual or collective chimney.

Connection to the collective chimney should be made through an air lock with the connection to the vertical collector of branch ducts through the floor (at the level of each storey above).

The cross-section of factory-assembled flue ducts for chimney flues from fireplaces must be at least 8 cm^2 per 1 kW of rated heat output of fireplaces.

7.11.19 Transit air ducts routed outside the fire compartment to be served must be designed with a fire resistance rating of at least EI 150 after crossing the fire barrier of the served fire compartment.

These transit ducts may be designed with a non-standardized fire resistance rating if each duct is installed in a separate shaft with a fire resistance rating of at least EI 150. In this case, connected to such transit ducts collectors or ducts from the serviced fire compartment

must comply with the requirements of paragraph 6.18(b).

7.11.20 Transit ducts and manifolds of systems of any purpose from different fire compartments are allowed to be laid in common shafts with enclosing structures of non-combustible materials with a fire resistance rating of at least EI 150 under the conditions:

a) transit ducts and collectors within the fire compartment to be served are provided with a fire resistance rating of EI 30, floor branches are connected to vertical collectors through normally open fire dampers;

b) the transit ducts of the systems of another fire compartment must have a fire resistance rating of EI 150;

c) the transit ducts of the systems of another fire compartment must be with fire resistance rating EI 60, provided that fire dampers with normally open valves are installed on the ducts in places where they cross each fire barrier with a rated fire resistance rating of REI 150 or more.

7.11.21 Transit air ducts of systems serving vestibule airlocks in premises of categories A and B, as well as systems of local suction of explosive mixtures should be designed:

a) within a single fire compartment - with a fire resistance rating of EI 30;

b) outside the serviced fire compartment - with a fire resistance rating of EI 150.

7.11.22 Normally open fire dampers installed in the openings of enclosing building structures with the rated fire resistance limits and (or) in the ducts crossing these structures, should be provided with fire resistance limits:

- EI 60 - when the rated fire resistance limit of the fire barrier is REI 150 or more;
- EI 45 - at the standard fire resistance limit of fire barrier REI 60;
- EI 30 - at the rated fire resistance limit of the fire barrier or enclosing building structure REI 45 (EI 45);
- EI 15 - at the rated fire resistance limit of the fire barrier or enclosing building structure REI 15 (EI 15).

It is allowed not to install normally open fire dampers when transit air ducts cross fire barriers or building structures with the rated fire resistance limits (except envelope structures of shafts with ducts laid in them of other systems) when ensuring fire resistance limits of transit

The fire resistance of the air ducts is not less than the fire resistance limits of the crossed fire barriers or building structures.

In other cases, normally open fire dampers should be provided with fire resistance limits not less than those specified for the ducts in which they are installed, but not less than EI 15.

Air inlets and leaks through leaking fire dampers must comply with the requirements of Appendix M.

The actual fire resistance limits of various fire damper designs should be determined in accordance with GOST R 53301.

7.11.23 The places where transit ducts pass through walls, partitions and ceilings of buildings (including in enclosures and shafts) should be sealed with non-combustible materials, ensuring the rated fire resistance limit of the enclosing structure crossed, except for the places where ducts pass through ceilings (within a served compartment) in shafts with transit ducts made according to subparagraphs "b", "c" of paragraph 7.11.21 and subparagraphs "a" - "c" of paragraph 7.11.22.

8 Refrigeration

8.1 The refrigeration system should be designed using natural and artificial sources of cold.

As a natural source of cold should be used:

a) artesian water and drinking water - during the warm period of the year in direct and indirect evaporative air cooling units. The use of artesian water for direct cooling of heat exchangers without water recycling system is not allowed;

b) outside air - for absorption of excess heat removed from the premises, cooling of circulating water and cooling of the coolant;

c) ground of surface and deeper layers - to absorb thermal excesses removed from the premises, as well as to cool the coolant under the condition of regeneration of the consumed ground heat during the year (to preserve the bearing capacity of the ground, this method is prohibited to use on the permafrost soils).

As artificial sources of cold should be used refrigeration machines and systems operating in accordance with GOST 12.2.233:

(a) Intermediate cooling:

- Refrigeration machines and heat pumps steam-compression or absorption,

b) direct cooling:

- window air conditioners, mobile air conditioners, split systems, multi-split systems, multizone systems with variable refrigerant flow, air handling units and local ducts with built-in evaporator unit and outdoor compressor and condenser unit, precision and rooftop air conditioners.

Direct cooling units may not be used in rooms with open flames, except for split systems with A1 (non-combustible) hazard class refrigerant.

N o t e - The use of ammonia compressor refrigeration units is not regulated by these building standards.

8.2 For hydraulic circuits of the refrigeration system outside the warm circuit of the building completely or partially, it is recommended to use non-freezing fluids (antifreezes) with an operating life of at least 5 years as a coolant.

For hydraulic circuits within a warm building circuit, treated water with corrosion and foaming inhibitors must be used as the operating medium. The use of untreated water as a cooling medium is not permitted.

Concentration of antifreeze fluid should be determined taking into account the design temperature of the outside air during the cold period of the year according to parameters B.

8.3 The design of refrigeration systems should take into account the requirements of safety and environmental protection.

Refrigeration systems should use refrigeration machines and units that use environmentally friendly refrigerants with zero ozone depletion potential and a global warming potential not exceeding 2500.

The hazard group of the refrigerants used should be taken as A1 (non-toxic, non-flammable) or A2 (non-toxic, non-flammable).

Group A2 refrigerants have a limited range of applications: they should not be used in direct-cooling multizone systems or in water-cooled or remote condensing refrigeration machines.

Equipment with refrigerants of hazard groups A3, B1, B2, B3 is not allowed for air conditioning systems, with the exception of process air conditioning installations.

8.4 For refrigeration systems, at least two refrigeration machines or one machine with two or more compressors and

evaporative circuits providing at least 50% of the cooling capacity each.

It is allowed to provide one single-circuit, with one compressor refrigeration machine up to 500 kW with adjustable cooling capacity of 25% or less.

8.5 Backup refrigeration machines should be provided for air conditioning systems operating around the clock or by design specification.

For refrigeration systems that provide 24-hour, seasonal or year-round maintenance of specified air parameters in air conditioned rooms with increased reliability requirements of equipment operation (equipment rooms, server rooms, computer centers, etc.), it is necessary to provide 100% redundancy of cooling sources.

No provision is made for auxiliary cooling equipment (tanks and reservoirs, make-up pumps, cooling towers, etc.), except as required by process design standards (medical facilities, data centers, etc.).

8.6 Supply of a non-freezing fluid (antifreeze) containing hazardous substances of hazard classes 1-3 according to GOST 12.1.007 in zone coolers (fan-coils), air coolers supply systems of air supply units, air conditioners installed in residential, public and administrative and domestic buildings is not allowed, except for antifreezes of hazard class 3 according to GOST 12.1.007, provided that they meet the hygienic requirements.

8.7 When using non-freezing liquid in the system of cold supply it is necessary to provide installation of a tank for filling or emptying the system or its separate parts (equipment, pipelines), divided by stop valves, during start-up, maintenance and repair works, accident, as well as for scheduled replacement and disposal of antifreeze. The volume of the tank should be not less than the maximum volume of the antifreeze solution drained from each part of the refrigeration system. Drainage of the used antifreeze into the household or rainwater drainage system is not allowed.

8.8 Maximum and minimum temperature and quality of water (non-freezing solution) supplied to evaporator and condenser circuits of refrigeration machines should be taken in accordance with the technical specifications for refrigeration machines.

The design temperature difference between cold and circulating water (solution) in the evaporator and condenser is recommended to be between 4 °C and 6 °C.

Cold losses in the equipment and pipelines of refrigeration systems should not exceed 7% of the cooling capacity of the refrigeration system.

8.9 Refrigerant concentration in case of its emergency release from the circulation circuit in each of the serviced premises shall not exceed the ELVF value and 10% of the LELV, taking into account the supply of outdoor air by the system of general mechanical supply and exhaust ventilation of continuous operation. Data on the values of LELF (practical limit of refrigerant concentration when a person is in the room) and LELF (Lower Concentration Limit of Ignition) are given in GOST 32968.

The maximum mass of refrigerant, kg, in the installation is calculated according to the formula:

$$G_{max} = \text{ELF} \times L_{общ}\ , \qquad (8.1)$$

where $L_{общ} = V_{пом} + L/4$;

$V_{пом}$ - volume of the room, m^3 .

L - supply of outside air by mechanical ventilation system, m^3 /h. In the premises of the refrigeration centers, the mass of the refrigerant at the emergency emission of which can exceed PPH or 10 % of the NCRP, concentration detectors (detectors) of emergency refrigerant should be installed. alarms.

8.10 Compressor and absorption refrigeration machines should be used with utilization of condensing heat in a feasibility study or according to the design task.

8.11 The main and auxiliary refrigeration equipment should be located in technical rooms - refrigeration centers.

Compression-type refrigerating machines (with oil content in any of the refrigerating machines of 250 kg or more) may not be placed in residential, public, administrative and industrial buildings if there are rooms with permanent or temporary stay of people above their ceiling or under the floor.

In residential buildings, health and social service buildings (hospitals), children's institutions and hotels, it is not allowed to locate compression refrigerating machines and installations with the refrigerant refrigerant, the refrigerating capacity of one unit of equipment more than
200 kW in rooms if there are rooms with permanent or temporary occupancy above their ceiling or under the floor.

8.12 Chillers, fan coolers, dry coolers, air-cooled condensers are allowed to be placed on the roofs of buildings and open areas, excluding the possibility of falling

of the air emitted into the outdoor air intakes, as well as taking into account the wind rose and snow cover.

Outdoor units of split-type air conditioners with a cooling capacity of up to 18 kW are allowed to be placed on unglazed loggias and in the volume of open stairwells, provided that the rated evacuation passages, noise protection and condensate drainage are provided.

8.13 Refrigeration machines should be designed with a buffer tank to ensure that the compressor is switched on and off no more than four times during one hour or other time period, according to the technical data of the equipment used (taking into account the internal volume of equipment and piping).

8.14 Open and closed fan cooling towers should be used for water recycling systems. Open fan cooling towers may be used for operation during the warm period of the year.

8.15 Outdoor air parameters for calculating air-cooled condensers, dry coolers and fan cooling towers should be taken into account where they are located (in the shade, in the sun, on a flat roof near roofs or walls, etc.), but not less than the calculated outdoor air parameters for refrigeration and air conditioning systems:

a) for refrigeration machines and units with air-cooled condensers located in the shade - at least 3 °C above the temperature of the dry thermometer (parameters B) and 5 °C above - for condensers exposed to the sun;

b) for fan cooling towers located in the shade, 1.5 °C above wet-bulb temperature for Parameter B and 3 °C above for fan cooling towers exposed to the sun.

When air-cooled condensers and fan cooling towers are placed on a flat roof, no more than 3 m from the walls on all sides, the calculated temperatures in a) and b) should be increased by 5^{o} C and 3 °C, respectively.

8.16 efrigeration centers with compression refrigeration machines with a total capacity of more than 1500 kW must be equipped with technological tanks (drainage receivers) for the collection and disposal of the refrigerant. The use of mobile plug-in devices is allowed.

8.17 Lithium bromide refrigeration machines should be placed in open areas; lithium bromide refrigeration machines may be placed in separate buildings or separate rooms of buildings of different purposes.

8.18 Equipment, fittings, pipelines, instrumentation and gaskets in direct contact with refrigerants, refrigerant solutions and lubricating oils should be made of materials that are chemically resistant to their effects and have sufficient mechanical strength.

Pipelines transporting liquid and gas refrigerants should be performed:

- of cold-deformed round copper tubes;
- copper drawn or cold-rolled pipes and fittings and products from the same manufacturer;
- steel seamless hot-deformed pipes.

It is not allowed to use pipelines of cold supply systems with internal galvanizing in hydraulic circuits filled with non-freezing solutions.

The use of used and refurbished pipes, profiles, sheets and other metal structures, materials and fittings are not allowed.

Installation of refrigerant pipelines with non-flammable gas from outdoor units of air conditioners in transit through the premises of the apartment corridor, fire safety zone, elevator lobby in elevators is allowed only in blind boxes or in the lining with the rated fire resistance limit not less than the fire resistance of fire barriers and / or enclosing building structures on the signs (R)EI.

8.19 Premises in which lithium bromide and steam-jet refrigeration machines and heat pumps are located should be assigned to category D for fire hazard.

8.20 In the rooms of refrigeration centers should be provided general exchange ventilation, designed to remove excess heat.

Supply and exhaust ventilation systems with mechanical inducement should provide at least four air changes per hour in the operating mode.

Emergency ventilation must be activated by the refrigerant detectors in the refrigeration center. The frequency of air exchange of emergency ventilation is determined by calculation, but not less than five air exchanges per hour. The air is removed evenly from the upper and lower zones of the room, the air is supplied to the working zone.

8.21 Refrigeration systems should be designed with energy efficient equipment of at least the two highest energy efficiency classes (A and B). Recommended minimum values of the required

coefficients of energy efficiency of refrigeration equipment in are given in Table 8.1.

Table 8.1-Minimum values of energy efficiency coefficients of refrigeration equipment

Energy efficiency class	Energy efficiency coefficient, kWh/kW	Refrigeration equipment			
		Direct (direct) cooling	Intercooling, chiller condenser type		
		split systems, multi-split-systems, multizone systems with variable flow refrigerant, compressor and condenser units, rooftop air conditioners.	Air-cooled	Water-cooled	Takeaway
A, B	EER	3,0	2,9	4,65	3,4
	COP	3,4	3,0	4,15	-
	ESEER	4,6	3,5	5,0	-

N o t e - EER - Energy Efficiency Ratio, or cooling ratio, equal to the ratio of total cooling capacity to total energy consumption; ESEER - average chiller efficiency at full and three part-load options; COP - (performance ratio, equal to the ratio of total heating capacity to total energy consumption.

8.22 On refrigerating machines and installations with refrigerant installed in refrigeration centers, refrigerant discharge pipelines from safety valves of refrigerating machines and installations outside the building should be provided. The mouth of exhaust pipes for refrigerant discharge upwards from safety valves should be provided not less than 2 m above the roof and not less than 5 m above the ground level.

8.23 Air-cooling units for refrigerating machines and installations with a capacity of more than 100 kW (remote condensers, dry coolers, etc. coolers) can be equipped with additional evaporative air cooling systems, thereby increasing their efficiency when working during the warm period of the year.

9 Fire safety requirements for heating, ventilation and air conditioning systems

9.1 Buildings or structures and their internal heating, cooling, heating, ventilation and air conditioning systems must be designed and constructed so that during operation the possibility of a fire is eliminated, the danger of smoke in the building or structure is prevented or limited and the effects of fire hazards on people are stopped, and the following requirements are met in the event of a fire:

- Limiting the formation and spread of fire hazards within the hearth of the fire;
- The non-proliferation of fire to neighboring buildings or structures;
- evacuation of people (taking into account the features of low mobility and other groups with limited mobility) to a safe zone before harm to life and health due to the effects of dangerous factors of the fire;
- The possibility of access to personnel of fire departments;
- the possibility of carrying out activities to save people.

9.2 To prevent the spread of combustion products in a fire into the premises through the air ducts of the general ventilation, air heating and air conditioning systems must be provided:

- fire protection normally open dampers, air closures and other devices on the ducts of the systems;
- Normally open fire dampers - at the intersections of building envelopes with the rated fire-resistance limits of the premises served by the air ducts;

If, for technical reasons, it is not possible to install fire dampers or air locks, it is not permissible to combine ducts from different rooms into one system. In this case, separate systems without fire dampers or air closures must be provided for each room.

9.3 The actual fire resistance limits of various structures of ventilation ducts of supply and exhaust smoke ventilation, including steel ducts with fire-retardant coatings and duct construction, should be determined by the results of tests.

9.4 Fire resistance limits of ducts and collectors (except transit) ventilation systems of any purpose, laid in the premises for ventilation equipment, as well as ducts and collectors, laid outside the building (except for smoke exhaust ventilation systems), are not regulated.

Fire resistance limits of transit air ducts should be taken in accordance with Appendix H.

9.5 For buildings and premises equipped with automatic fire extinguishing systems and (or) automatic fire alarm systems, automatic shutdown in case of fire of the general ventilation, air conditioning and air heating systems should be provided, as well as the closure of normally open fire dampers.

The need for partial or complete shutdown of ventilation systems and closure of fire dampers must be determined in accordance with technological requirements.

9.6 Anti-smoke ventilation should be provided to prevent the damaging effects on people and (or) material assets of the products of combustion spreading in the interior volume of the building when a fire occurs in one room on one floor of one fire compartment.

9.7 The calculation of the required parameters of smoke ventilation systems or general ventilation systems combined with them is recommended on the basis of generally accepted methods that do not contradict this section and the Law of the Kyrgyz Republic "On Fire Safety".

The design parameters of the outdoor air should be taken according to parameters B.

When selecting the design parameters of smoke ventilation systems, the balance between the flow rate of exhausted combustion products and the replacement of its supply air should be maintained, taking into account the requirements of p. 9.21. It is not allowed without an appropriate calculation justification to accept imbalance between these flows, as in the application of systems with mechanical draft control, as well as in the application of systems with natural draft control, including various combinations.

9.8 When using mechanical supply and exhaust smoke ventilation systems, as well as functionally combined with them general ventilation systems, the pressure characteristics (static pressure) of the fans of the exhaust smoke ventilation system, which provides removal of combustion products from the protected area (or corridor) and the supply smoke ventilation system, which provides compensation for the volume of combustion products removed by the supply air must not differ by more than 5%, and the pressure characteristic of each of the fans in these systems must not exceed 1000 Pa (reduced to 20^{o} C).

These restrictions do not apply to rooms located in single-story buildings and equipped with escape exits directly to the outside, as well as the use of smoke ventilation systems referred to in 9.16.

9.9 To ensure the standard conditions of operation of supply and exhaust smoke ventilation systems, it is allowed to provide the discharge of excess pressure from the internal volumes of un-smokeable stairwells, air locks, safety corridors, fire protection zones, etc. rooms. For discharge of excess pressure it is recommended to use excess pressure valves or other devices in the outer enclosures of the protected volumes, similar devices are recommended to use in bundles of fans, when the latter are located in ventilation chambers (hydraulically connected with the outside environment) or outside the building, frequency converters of fans motors of supply smoke ventilation systems (not allowing frequency exceeding 50 Hz), bypass ventilation lines with the installation of cl

If it is technically necessary to install excess pressure valves in the enclosing building structures of airlocks, including for the purpose of compensating the volume of combustion products removed by the incoming air, they should be protected from the

thermal impact by installing additional fences with overflow grids from the side adjoining the airlock room. These enclosures should have a fire-resistance limit not less than that established for the building envelopes of the airlock, and the passage sections of the overpressure valve and overflow gratings should be at a distance of at least 1.5 m from each other (from edge to edge) horizontally or vertically. In this case, the outside air flow rate entering the room through the overpressure valve must be taken into account in the balance with the flow rate of combustion products removed.

9.10 Removal of combustion products from storeroom units, loading rooms, garbage storage rooms, other technological rooms, the need for which is justified by the technology of the building, with an area not exceeding 250 m^2, located on the territory of built-in buildings

The smoke exhaust ventilation systems serving the premises of the underground parking lot or isolated ramp, provided that they are located in a common fire compartment, is allowed to provide the solution by calculating the basic parameters of the smoke ventilation.

9.11 For a dormitory air lock located on the escape route and designed for entry from two or more separate rooms, the air supply by the smoke ventilation system should be determined on the basis of the need to ensure air flow rate equal to 1.3 m/s through only one doorway of the largest area.

The requirement does not apply to a vestibule airlock with more than one entrance from the same room.

In all cases, the overpressure in the airlock at all closed doors must be in the range of values from 20 to 150 Pa.

9.12 Smoke ventilation systems shall be independent for each fire compartment, except for supply smoke ventilation systems designed to protect stairwells and elevator shafts communicating with various fire compartments, and exhaust smoke ventilation systems designed to protect atriums and passageways with no structural division into fire compartments.

9.13 For high-rise buildings, zoning of supply and exhaust smoke ventilation systems, as well as the general ventilation systems functionally combined with them, should be performed by height, and the boundaries of such zones should coincide with the technical (including those combined with serviced and living spaces) floors designed to house the building's engineering systems.

It is not allowed without appropriate justification to design ventilation networks of supply and exhaust smoke ventilation systems, as well as functionally combined with them systems of general ventilation, resistance more than 1000 Pa.

The location of fans of supply smoke ventilation systems designed to create excess pressure in the protected rooms and volumes, as well as designed to compensate for the volume of combustion products removed by the supply air, should be mainly provided in

the lower part of the served area. If this condition cannot be met, the maximum length of the vertical ventilation manifold as part of such a system should not exceed 50 m.

Emission of combustion products to the facade from the smoke exhaust ventilation systems located on the technical floors should be carried out at a speed of at least 20 m/s.

9.14 For supply and exhaust smoke ventilation systems, as well as functionally combined with them general ventilation systems, the maximum velocity in the elements of systems (fire dampers, ducts, grilles, etc.) should be taken no more than 11 m/s.

When it is impossible to meet this condition (under the limited conditions of laying ventilation ducts), it is allowed to increase the maximum speed in the ducts of smoke ventilation systems to 20 m/s, taking into account 9.13.

9.15 When choosing the aerodynamic scheme of fans of supply and exhaust smoke ventilation systems, preference should be given to the axial scheme.

In all cases, the use of medium and high pressure radial fans is allowed only in exceptional cases, including those specified in 9.13.

9.16 When using mechanical exhaust smoke ventilation systems in combination with supply smoke ventilation systems that are not equipped with supply fans, the following requirements should be observed:

- the design pressure of the fan of the exhaust smoke ventilation system must be increased by the value of the resistance of the ventilation network of the supply smoke ventilation system at the design flow of the exhaust smoke ventilation system;
- the resistance of the ventilation network of the intake smoke ventilation system should not exceed 150 Pa.

9.17 Industrial premises of fire hazard class F5.1 of categories B3, B4, D by fire and explosion hazard (including ventilation chambers, elevator engine rooms, pump rooms, etc., referred to these categories), communicating with unventilated stairwells through doors and other openings shall be protected by smoke extraction and smoke ventilation systems.

These rooms may not be protected by smoke exhaust ventilation systems, provided that smoke-proof fire doors are installed at the exits to such stairwells.

9.18 Transit ducting of general ventilation systems, as well as supply smoke ventilation systems is allowed ventilation through vestibule airlocks, elevator halls and stairwells, provided that the fire resistance limit (in terms of loss of integrity and insulating capacity) of transit air ducts is not less than that established for the enclosing building structures that enclose the crossed rooms and volumes.

9.19 Removal of combustion products in case of fire by smoke exhaust ventilation systems should be provided:

a) from the corridors and halls of residential, public, administrative and residential and mixed-use buildings over 28 m in height;

b) from corridors and pedestrian tunnels of basements and ground floors of

residential, public, administrative and domestic, industrial and multi-functional buildings at exits to these corridors (tunnels) from premises with permanent residence of people;

c) from corridors without natural ventilation in a fire longer than 15 m in buildings with two or more floors:

- production and storage categories A, B, C;
- public and administrative and amenity facilities;
- multifunctional;

d) from common corridors and halls of buildings of different purposes with unventilated stairwells;

e) from atriums and passages;

f) from each production or storage rooms with permanent workplaces, without natural light or with natural light without mechanized drives to open the transoms at the top of the windows at 2.2 m and above from the floor to the bottom of the transoms and to open the openings in the skylights (in both cases the area sufficient for smoke removal in case of fire, including book depositories of libraries, storage and restoration workshops of museums, archives (and for high-rise storage rooms - regardless of the presence of permanent workplaces), if these rooms are assigned to categories A, B, B1, B2, B3 in buildings of I-IV degree of fire resistance;

g) from each room on the floors communicating with unventilated stairwells, or from each room without natural ventilation in case of fire:

- with a high density of people;
- sales halls;
- offices;
- with an area of 50 m^2 or more with permanent workplaces, intended for the storage or use of combustible substances and materials;
- dressing rooms of 200 m^2 and more;
- road, cable, switchboard with oil pipelines and technological tunnels, built-in and communicating with the underground floors of buildings of various purposes;

h) from car storage areas of enclosed above and underground parking lots, separately located, built-in or attached to buildings of other purposes (with parking both with and without the participation of drivers - with the use of automated devices), as well as from the isolated ramps of these parking lots.

It is allowed to design the removal of combustion products through the adjacent corridor from the premises with an area up to 200 m^2 : production categories B1, B2, B3, as well as those intended for storage or use of combustible substances and materials.

For sales halls and office space of no more than 800 m^2 when the distance from the most distant part of the room to the nearest evacuation exit is not more than 25 m, removal of combustion products is allowed through adjoining corridors, halls, recreations, atriums and passages.

Dead-end parts of corridors in buildings of various purposes may not be divided by

partitions with doors in sections of less than 15 m in length.

9.20 The requirements of paragraph 9.19 do not apply:

a) on premises with an area of up to 200 m^2, equipped with automatic water or foam fire-extinguishing installations (except premises of categories A and B, premises communicating with un-smokeable stairwells of type H2 or H3, and closed parking lots with parking with participation of drivers);

b) on the premises equipped with automatic gas, aerosol or powder fire extinguishing installations (except for closed parking lots with parking with the participation of drivers);

c) corridors and halls, if the direct removal of combustion products from all rooms communicating with them through doorways is provided;

d) for rooms of up to 50 m^2 each, located in the area of the main room, from which the removal of combustion products is provided;

e) for corridors (other than those specified in subparagraphs (a) and (b) of paragraph 9.19) without natural ventilation in case of fire, if in all there are no permanent workplaces in the rooms with exits into this corridor, and fire doors in smoke and gas tight design with a minimum specific resistance to smoke and gas permeation of at least 1.9610^5 m^3 /kg are installed at the exits from these rooms into this corridor; the actual resistance to smoke and gas permeation of fire doors must be determined in accordance with GOST R 53303;

f) for public premises, built in or attached to the lower ground floor of residential buildings, structurally isolated from the residential part and having evacuation exits directly to the outside, with the greatest distance of these exits from any part of the premises not exceeding 25 m and the area of each room not exceeding 800 m^2 .

9.21 The flow rate of combustion products removed by the exhaust smoke ventilation should be calculated depending on the heat release rate of the fire, heat loss through the enclosing building structures and ventilation ducts, the temperature of combustion products removed, outdoor air parameters, condition (positions) of door and window openings, geometric dimensions:

a) for each corridor not exceeding 60 meters in length - in accordance with subparagraphs "a" - "d" of paragraph 9.19;

b) for each smoke zone with an area not exceeding 3,000 m^2 in the premises - in accordance with subparagraphs "e" - "h" of paragraph 9.19.

It is not allowed to take without calculation fixed values of the temperature of combustion products removed from corridors or rooms.

The outside air temperature should be taken for the warm period of the year, the wind speed at the highest values regardless of the period of the year.

When supply and exhaust smoke ventilation systems work together, a negative imbalance in the protected room is allowed when the pressure drop on the closed doors of emergency exits is not more than 150 Pa. Positive imbalance is not allowed.

9.22 When determining the flow rate of combustion products to be removed, take into account:

a) air infiltration through leaks in the ducts of smoke exhaust ventilation systems;

b) air leaks through the leaks of closed fire dampers according to the certification test reports (the actual values of the specific smoke and gas permeability characteristics of the tested samples), but not more than determined by the formula

$$G_{da} F_d (P_d / S_d)^{0,5}, \quad (9.1)$$

where

Fd - area of the valve cross-section, m2;

ΔPd - pressure drop across the closed valve, Pa;

Sd - specific resistance characteristic of smoke and gas permeation of the valve, m3

Minimum allowable value of smoke and gas permeation resistance/kg.

for valves of different design should not be less than 2.410^3 m^3 /kg.

9.23 Exhaust smoke ventilation systems designed to protect corridors should be designed separately from systems designed to protect rooms. It is not allowed to have common systems for the protection of rooms with different functional fire hazards.

For the protection of corridors of public premises under sub-clause "e" of clause 9.20 and corridors of residential premises on the upper floors, common smoke exhaust ventilation systems may be provided if all these rooms are located in one fire compartment.

9.24 Buildings where no specific technology is provided for the operation of floors (floors of free plan), which in the further operation of the building as a result of the division into parts may contain corridors and rooms to be protected by exhaust smoke ventilation under subparagraphs "a",
"c", "d", "g" paragraph 9.19, must have smoke exhaust ventilation systems of both of these types. In this case, the flow rate of combustion products removed by systems designed to protect rooms should be determined according to subparagraph "b" of paragraph 9.21, taking into account the entire floor area minus the area of stair and elevator units on the floor.

9.25 When removing combustion products from corridors, smoke collection devices should be placed on the shafts under the ceiling of the corridor, but not below the upper level of doorways of evacuation exits. It is allowed to install smoke-receiving devices on the branches to the smoke shafts. The length of the corridor per smoke-accepting device shall be as follows:

- not more than 45 m with a rectilinear configuration of the corridor;
- not more than 30 m with the corner configuration of the corridor;
- not more than 20 m with a circular (closed) configuration of the corridor.

The length of the corridor should be defined as the sum of the lengths of conventionally selected and sequentially arranged sections of rectangular shape or close to it in plan.

9.26 When removing combustion products directly from rooms with an area of more than 3000 m^2 they must be structurally or conditionally divided into smoke zones, each with an area not exceeding 3000 m^2 , taking into account the possibility of the occurrence of fire in one of the zones. The area of the room per smoke-accepting device shall be determined by calculation and shall not exceed 1000 m^2.

The division of the room into conditional zones with an area not exceeding 3000 m^2 should be performed by one of the following technical solutions:

- zones (passages) free from fire loads, with a width of at least 8 meters;
- zones (passages), free from fire load, a width of at least 6 m with the device in the middle of the zone of single-strand drencher curtain with the calculated number of sprinklers, ensuring the entire length of the specific flow of 1 liter / s.m. or automatically lowered in case of fire to the calculated height of the smoke screens (curtains).

At the same time, organizational measures should be provided to prevent the placement of fire loads within the specified zones (passageways).

When structurally dividing the room by smoke screens into smoke zones, the activation of the smoke exhaust ventilation system should be provided only in the smoke zone with the seat of fire, and when conditionally divided into smoke zones, the activation of smoke exhaust ventilation systems should be provided simultaneously in all rooms adjacent to the smoke zone with the seat of fire.

10 Requirements for space-planning and structural solutions

10.1 For rooms (including attics and technical floors) in residential, public, administrative and industrial buildings, which housed ventilation equipment, should comply with the requirements of MSN 3.02-04, SNiP 31-05.

10.2 In residential apartment buildings, measures should be taken to reduce the mutual thermal influence of adjacent apartments, including in terms of increasing the thermal resistance of internal inter-apartment walls and floors, harmonizing these measures with the increase of sound insulation between neighboring apartments.

10.3 Rooms for ventilation equipment should be located within the fire compartment to be served.

Rooms for ventilation equipment may be located outside the served (protected) compartment.

10.4 Premises for equipment of exhaust and supply systems, refrigeration centers should be assigned to explosion and fire hazard categories according to 7.10.19, 7.10.20, 8.22.

Enclosing building structures of rooms for ventilation equipment of general ventilation systems should be taken according to 7.10.23.

10.5 Enclosing building constructions of rooms for ventilation equipment of general ventilation systems located in the fire compartment, where the rooms served by these systems are located, must have fire resistance limits of at least EI 45, smoke ventilation systems - taking into account the requirements of paragraph 9.29, subparagraph
"a" of paragraph 9.34.

Doors of such rooms (with the exception of rooms for ventilation equipment of general ventilation systems classified as category D) must be fireproof type 2.

10.5 Rooms for ventilation equipment located outside the fire compartment in which serviced and (or) protected rooms are located, must be surrounded by building structures with a fire resistance rating of at least EI 150.

Doors of such rooms must be fireproof type 1.

10.6 In buildings whose rooms are not protected by smoke ventilation, the open fixed position of elevator shaft doors on the main landing or other floors is not allowed.

10.7 At the exits from the elevators to the car storage rooms of underground parking lots should be provided vestibule airlocks, protected by the supply of smoke ventilation. If such elevators have at least two stops on the above-ground floors, the floors of the underground parking lot should be equipped with two consecutive vestibule airlocks to separate the exits from these elevators to the car storage rooms, protected by separate systems of smoke ventilation.

10.5 Premises with dust collectors for dry cleaning of explosive mixtures can not be placed under the premises with mass (except in emergency situations) stay of people.

10.6 No piping may be laid through the room for ventilation equipment:

a) with flammable and combustible liquids and gases;

b) sewage with sweeps and revisions (except pipelines of storm water drainage and drainage from overhead rooms for ventilation equipment, including from the ventilation equipment); it is allowed to lay sewage pipes on the clamp sleeveless joints.

10.7 To ensure repair of equipment (fans, electric motors) weighing more than 100 kg per unit of equipment or part of it should include lifting machines (if mechanisms designed for technological needs can not be used).

10.8 Openings or windows of production facilities designed for natural air supply in the warm season, should be placed at a height of not more than 1.8 m from the floor or work area to the bottom of the opening, and for air supply in the cold season - at a height of not less than 3.2 m.

10.9 For sashes, transoms or blinds in the light openings of industrial and public buildings, placed at a height of 2.2 m or more from the floor or work area, remote and manual opening devices should be provided, placed within the working or serviced area of the room.

10.10 Stationary ladders and platforms, mobile ladders and devices should be provided for maintenance of equipment, fittings and devices located above 1.8 m or more from the floor or ground level, in accordance with safety regulations.

Valves, appliances, ventilation and heating units, as well as self-contained air conditioners should be repaired and serviced from mobile devices while observing the established safety rules.

10.11 Permanent workplaces located less than 3 m from exterior doors and 6 m from the gate should be protected by partitions or screens against blowing cold air.

10.12 Building structures of rooms for heating, ventilation and refrigeration equipment should be provided taking into account the use of lifting mechanisms in them, according to 10.7, with the height of the rooms from the clear floor level to the bottom of the projecting structures of the floors is set by the design task not less than 2.2 m. In the rooms and working areas the width of the passage between the protruding parts of the equipment, as well as between the equipment and building structures shall be provided taking into account the performance of installation and repair work, but not less than 0.7 m. The distance between the equipment should be provided, allowing for the dismantling and subsequent installation of individual pieces of equipment with the maximum dimensions.

If necessary, provide special openings in walls and ceilings for installation/dismantling of ventilation equipment or use equipment that provides for small-knot assembly on site.

The floor structure in such rooms must be designed to withstand the loads arising during transportation of the ventilation equipment assemblies on the hoisting cart, as well as be resistant to dropping solid objects weighing no more than 20 kg during transportation.

10.13 For installation and removal of ventilation or refrigeration equipment (or replacement of parts) should be provided mounting openings.

11 Electric power supply and automation of HVAC systems

11.1 Electricity

11.1.1 Electrical installations of heating, ventilation, air conditioning and smoke ventilation systems must comply with the requirements of national standards for electrical installations of buildings.

11.1.2 Reliability of power supply to electrical consumers of internal heating and cooling, ventilation and air conditioning systems should be provided in the same category as that established for electrical consumers of technological or engineering equipment of the building.

11.1.3 Electric power supply to emergency ventilation and smoke protection systems, except systems for gas and smoke removal after a fire should be provided for Category I. If local conditions make it impossible to supply power to Category I consumers from two independent sources it is allowed to supply them from a single source - from different transformers of a two-transformer substation or from two nearby single-transformer substations. In this case, the substations must be connected to different supply lines, laid on different routes, and have automatic backup input devices, as a rule, on the low-voltage side.

11.1.4 For water-heated supply ventilation systems, the power supply to the freeze protection control circuits should be designed to provide Category I reliability. The II category of reliability of power supply should be ensured by separate power supply of the fan drive and the automation panel of the air handling unit.

In the control circuits of electrical consumers of smoke ventilation systems it is not allowed to use electrical protection devices with thermal cutoffs.

11.1.5 Earthing should be provided for the equipment of metal piping and ducts of heating and ventilation systems of A and B categories, as well as local exhaust systems that remove explosive mixtures.

11.2 Automation

11.2.1 Formation of a signal to turn on the executive elements of the smoke ventilation equipment of buildings and structures in

automatic mode must be performed in accordance with the requirements of the current regulatory documents.

11.2.2 Control of smoke ventilation equipment actuators shall be in automatic (from automatic fire alarms or automatic fire extinguishing systems) and remote (from the control room of the dispatch personnel on duty and from the buttons installed at the evacuation exits from the floors or in fire cabinets) modes.

Controlled joint operation of the systems is regulated depending on the actual fire situations determined by the location of the fire in the building, the location of the burning room on any of its floors. The specified sequence of operation of the systems must ensure that the exhaust smoke ventilation is activated 20 to 30 seconds ahead of the start-up of the supply smoke ventilation. The required combination of jointly operating systems and their total installed capacity, the maximum value of which should correspond to one of these combinations, should be determined according to the smoke ventilation control algorithm to be mandatorily developed in the calculations of the required parameters.

11.2.3 Switching off ventilation systems in case of fire should be done centrally by cutting off the power supply to the ventilation distribution boards or individually for each ventilation system. Disconnection of water-heated supply systems in case of fire should be performed individually for each system with preservation of power supply to the freeze protection circuits. If it is not possible to maintain power supply to the freeze protection circuits, only the fan should be turned off by signaling the fire alarm system to the supply system fan remote control circuit. When organizing fan disconnection in case of fire using a circuit breaker with an independent breaker, a check of the signal transmission line for disconnection must be carried out.

P a g e

1 The need for partial or complete shutdown of ventilation systems should be determined by process requirements.

2 For rooms with only a manual fire alarm system, remote shutdown of the ventilation systems serving these rooms and the activation of smoke protection systems should be provided.

3 The requirements of this paragraph do not apply to household ventilation devices for apartments in residential buildings (breezers, wall recuperators, exhaust fans for bathrooms and kitchens, household humidifiers, etc.), with a capacity up to 100 m^3 /h, connected to the internal power supply network of apartments.

4 When a fire occurs within one apartment of a residential building, the mechanical exhaust ventilation system serving the exhaust ventilation network of that apartment shall be shut down without closing the air dampers on the path of that system to the point of air discharge to the outside.

11.2.4 For buildings and structures equipped with automatic fire extinguishing systems or automatic fire alarm systems, in case of fire the automatic blocking of electric receivers of air heating, ventilation, air conditioning, standalone and window air conditioners, fan coils, air/heat curtains and indoor units of multi-zone air conditioners with electric receivers of smoke ventilation systems should be provided for:

a) shutdown in case of fire ventilation systems, except for air supply systems in the vestibule airlocks of buildings of categories A and B, as well as in the engine rooms of elevators of buildings of categories A and B.

b) activation in case of fire of smoke ventilation systems (except systems for gas and smoke removal after the fire);

c) opening of normally closed fire dampers, including smoke dampers of smoke ventilation systems in the room or the smoke zone where the fire occurred, or in the corridor on the floor of the fire and closing of normally open fire dampers of general ventilation systems.

11.2.5 Normally closed fire dampers, including smoke dampers, smoke hatches, skylights, transoms and windows, as well as smoke screens with drop cloths designed for smoke protection, must have automatic and remote control.

11.2.6 The level of automation and control systems should be selected depending on the technological requirements, economic feasibility and the design task.

11.2.7 The parameters of the coolant (coolant) and air must be monitored in the following systems:

- internal heating - temperature and pressure of the coolant in the common supply and return pipelines in the room for the supply ventilation equipment; temperature and pressure - at the outlet of the heat exchangers;

- heating with local heaters - the air temperature in the control rooms (according to the design task);

- air heating and supply ventilation - supply air temperature and air temperature in the control room (according to the design task);

- air blowing - the temperature of the supplied air;

- air conditioning - temperature of outdoor, recirculation, supply air after the sprinkler chamber or surface air cooler and in the rooms; relative humidity in the rooms (if it is regulated);

- cooling - temperature, pressure, toxicity and viscosity of the coolant before and after each heat exchange or mixing device, the pressure of the coolant in the common pipeline;

- ventilation and air conditioning with filters, static pressure chambers, heat recovery units - air pressure and pressure difference (according to the design task).

11.2.8 In buildings and structures equipped with automation and dispatching system on the equipment of engineering equipment control systems, the monitored parameters should be displayed on the monitor of the dispatcher's automated workstation.

Control, on/off devices should be located at the location of the equipment. Remote monitoring devices should be installed according to the design specification.

For several systems whose equipment is located in the same room, it is necessary to provide one common instrument for measuring temperature and pressure in the supply pipeline and individual instruments on the return pipelines of the equipment.

11.2.9 When using controllers with analog sensors, the installation of visual observation instrumentation must be provided for by the design task.

11.2.10 In buildings equipped with automation and dispatching system to control engineering equipment (SP 134.13330) should be provided alarm deviation from the normal mode of operation of general ventilation systems.

11.2.11 Signaling of equipment operation ("On", "Failure") should be provided for systems:

- ventilation of rooms without natural ventilation (except bathrooms, toilets, smoking rooms, dressing rooms, etc.) production, administrative and residential and public buildings;

- local suction systems that remove hazardous substances of hazard classes 1 and 2 or explosive mixtures;

- General Exhaust Ventilation of rooms of categories A and B;

- exhaust ventilation of the premises of the warehouses of categories A and B, where the deviation of the controlled parameters from the norm can lead to an accident.

11.2.12 Remote control and registration of the main parameters in heating, ventilation and air conditioning systems should be provided in buildings equipped with automation and dispatching systems to control engineering equipment (SP 134.13330), according to the technological requirements and the design task.

The amount of information transmitted from the local automation panel to the dispatching system is determined by the design task, taking into account the operating conditions of the systems.

11.2.13 Automatic parameter control should be provided for systems:

- heating performed in accordance with 6.1.2;
- air heating and smothering;
- supply and exhaust ventilation operating with variable air flow, as well as with a variable mixture of outdoor air and recirculation air;
- of supply ventilation;
- conditioning;
- refrigeration;
- local after-moistening of indoor air;
- heating the floors of buildings.

For public, administrative and industrial buildings should include program regulation of parameters to reduce heat consumption.

11.2.14 Sensors for monitoring and controlling air parameters should be placed:

a) at characteristic points in the served or working area of the room in places where they are not exposed to heated or cooled surfaces and jets of supply air;

b) in recirculation (or exhaust) ducts, if the air parameters in them do not differ from the air parameters in the room or differ by a constant value.

11.2.15 Automatic blocking should be provided for:

a) opening and closing of the outside air dampers when the fans are switched on and off;

b) opening and closing valves of ventilation systems connected by ducts for full or partial interchangeability in case of failure of one of the systems;

c) closing fire dampers on the air ducts of systems to remove gases and smoke after a fire for premises protected by gas, aerosol or powder fire extinguishing installations when shut down

fans of the ventilation systems of these rooms;

d) switching on the standby equipment in case of failure of the main equipment according to the design assignment;

e) heating medium supply during switching on and off of air heaters and heating units;

f) activation of emergency ventilation systems when the air in the working area of the premises has concentrations of harmful substances in excess of MPC or MPL, as well as concentrations of flammable substances in the air of the premises in excess of 10% of the MAC of gas, steam and dust-air mixture.

11.2.16 Heating and heating systems with HII must be equipped with a control system that provides:

a) shutting off the gas supply when the automatic fire protection systems (smoke protection systems, fire alarms and fire extinguishing systems, etc.) are activated;

b) shutdown of gas supply in case of inadmissible deviation of gas pressure from the set pressure;

c) possibility of remote (from the control panel installed in an accessible place) disconnection of all emitters;

d) maintaining the required temperature in the working area of the room. The systems should use special sensors that respond integrally to the combination of air temperature and room radiation temperature.

Gas burner units of gas infrared emitters must be equipped with automatic protection means ensuring the shutdown of gas infrared emitters and stopping gas supply in case of malfunction or failure of gas infrared emitters.

Heating and heating systems must be interlocked with the local or general ventilation system, eliminating the possibility of starting and running the heating system when ventilation is not working.

11.2.17 Automatic interlocking of fans of local suction and general ventilation systems specified in 7.2.10 and 7.2.11 that do not have back-up fans with process equipment should ensure that the equipment stops when the fan fails, and if it is impossible to stop the process equipment, an emergency alarm should be activated.

11.2.18 For systems with variable outdoor or supply air flow rates, interlocking devices should be provided to ensure a minimum outdoor air flow rate.

11.2.19 For exhaust ventilation with air cleaning in wet dust collectors, automatic fan interlocking with the device for supplying water to the dust collectors should be provided, ensuring:

a) turning on the water supply when the fan is on;

b) stopping the fan when the water supply stops or the water level in the dust collector drops;

c) the fan cannot be switched on if there is no water or if the water level in the dust collector drops below the set level.

11.2.20 The activation of the air curtain should be blocked with the opening of gates, doors and technological openings or provide for the activation of the air curtain when the specified room air temperature at gates, doors and technological openings decreases. Automatic shutdown of the air curtain should be provided after closing the gates, doors or technological openings and restoration of the rated room temperature, providing for reduction of the heat carrier flow rate to a minimum to ensure non-freezing of water.

When using systems with electric air heaters, protection against overheating of the air heaters should be provided.

11.2.21 When water is used as the heat transfer medium in heat exchangers of ventilation and air intake systems, automatic frost protection should be provided.

11.2.22 Dispatching systems should be provided for production, residential, public and administrative buildings, which provide for the dispatching of technological processes or the operation of engineering equipment.

11.2.23 The accuracy of maintaining meteorological conditions in air conditioning (if there are no special requirements) should be taken at the points of sensor installation: ± 1 °C for temperature and ± 7% for relative humidity.

12 Water supply and sewerage of heating, ventilation and air conditioning systems

12.1 Water supply to irrigation chambers, humidifiers and booster humidifiers and other devices used to treat supply and return air should be of drinking quality.

If the water supplied for make-up to steam or water humidifiers does not meet the equipment manufacturer's pH and hardness requirements, pretreatment of the water must be provided.

12.2 Water of technical quality should be provided for wet dust collectors of exhaust systems (except recirculation systems), as well as for

flushing of supply and heat recovery equipment.

12.3 The quality of water that cools the equipment of refrigeration systems should be taken according to the technical conditions for the refrigeration machines.

12.4 Drainage of water into the sewer should be provided for draining the equipment of heating, heating and cooling systems and for drainage of condensate from the equipment of air conditioning systems through a water trap. It is recommended to provide solutions for condensate drainage before the odour trap in the "Heating, ventilation and air conditioning" section of the design documentation, after, including the odour trap in the "Water supply and sewerage" section.

12.5 Ventilation chambers for placement of central air conditioning equipment, supply equipment with water heat exchangers, rooms with air humidifiers, as well as rooms for placement of refrigeration equipment must be equipped with waterproofing, drains or pits for liquid removal.

13 Requirements for energy efficiency and rational use of natural resources

13.1 Energy efficiency requirements to eliminate the irrational consumption of energy resources in the operation of buildings and structures must be observed in the design, examination, construction, acceptance and operation of new, reconstructed, overhauled heated residential and public buildings according to the Law of the Kyrgyz Republic "On Energy Saving",
"The Energy Performance of Buildings and the Renewable Energy Sources Act.

The design documentation must provide for the equipment of buildings and structures with metering devices for energy resources used.

Compliance of internal heating and cooling, heating, ventilation and air conditioning systems of buildings and structures with the requirements of energy efficiency should be ensured by selecting the optimal engineering solutions in the design documentation.

13.2 To assess the building's heat demand for heating and ventilation use an indicator of the specific annual consumption of heat energy for heating and ventilation - a specific performance of heat consumption for heating and ventilation, determined in accordance with SNiP 23-01, SP 23-101 and MSN 2.04-02.

13.3 Energy saving of indoor heating, cooling, heating, ventilation and air conditioning systems of buildings and structures should be ensured through the selection of high-tech equipment, the use of energy-efficient schematic solutions and optimization of system management, including:

- using ventilation and refrigeration equipment of the highest energy efficiency classes;
- the use of condensing boilers for heat generation (when the maximum temperature of the coolant in heating systems is allowed to decrease to 80 ° C);
- application for TST (with a permissible reduction of the maximum temperature of the coolant to 60 ° C);
- application of two-pipe heating systems in residential buildings with individual regulation and heat accounting;
- installation of thermostats and radiator heat meters on radiators for vertical riser heating systems;
- Using supply and exhaust ventilation systems with mechanical stimulation, with recycling of exhaust air heat and individually controlled air exchange;
- using with autonomous and decentralized heat supply installations with combined system and system solutions using solar energy (solar collectors) for heat supply. Public and industrial public and industrial buildings - from reducing energy consumption and a reduction in the cost of heat, cold and electricity for dehumidification damp-proofing of the air should be carried out at . Include the calculation of applications:
- separate systems for rooms of different functionality and different modes of operation;
- ventilation systems with adjustable variable airflow (adaptive and personal ventilation);
- energy-efficient schemes for heat and humidity air treatment, including schemes for indirect and two-stage evaporative air cooling, devices for utilizing the heat and cold of the air removed from the premises;
- heat pumps and heat and cold accumulators to reduce peak loads;
- devices to reduce electric power consumption by electric drives of pumps, fans and compressors;
- energy-saving air curtains using all or partially unheated air;

- integrated active energy-saving systems.

13.4 Fans must be selected so that the operating mode was in the range of characteristics, limited to 0,8 of the maximum efficiency of the fan (GOST 10616). It should be determined the maximum efficiency of fans of different types and the total efficiency of the drive (including the efficiency of the motor, frequency converter, belt drive, etc.) according to GOST 33660.

13.5 In the systems of indoor heating and cooling, heating, ventilation and air conditioning of buildings in order to realize the savings of fossil fuels it is recommended to use RES and RE:

(a) The heat of recycled water supply systems and return water of district heating systems, as well as heat pumps, "gray" sewage, etc;

b) secondary energy resources (SER):

- Recuperation of heat air removed by general exchange ventilation and local exhaust systems (if technically possible);
- recuperation (total or partial) of the waste heat from the condensers of the refrigeration machines;
- recovery of waste heat of technological processes and installations operating continuously or at least 50% of the time per shift;

c) renewable energy sources (RES):

- the heat of the ambient air;
- the heat of the surface and deeper layers of the ground;
- the heat of ground and geothermal water;
- the heat of reservoirs and natural water flows;
- solar energy;
- wind energy, etc.

13.6 Combined use of renewable energy sources with RES and RES for heating, ventilation and air conditioning, the choice of heat (cold) utilization schemes, heat recovery equipment, heat pump installations, etc. should be provided taking into account the irregularity of heat (cold) from different sources, as well as schedules of heat and cold consumption in the systems.

13.7 The concentration of harmful substances in the supply air when using the heat (cold) of the HER shall not exceed that specified in 5.11.

13.8 Technical solutions for the rational use of natural resources must be taken at the design stage, by working through options for technical and economic proposals, implementation of technical and organizational measures, including:

- Improvement of methods of control and accounting of energy resources;
- Equipping apartments and built-in premises of residential buildings with metering devices and completing the transition to the settlement of managing organizations with the population for the actual consumption of heat energy, based on the readings of metering devices;
- Development and implementation of an automated heat and electricity metering system;
- Ensuring optimal modes of operation of heat supply equipment in order to reduce all types of energy resources used (heat, power, etc.);
- carrying out work to normalize and control the pressure (head) of water in heating units;
- Implementation of measures to optimize the pressure drop at the heat supply network inlet to the buildings;
- installation of vandal-proof fittings in common areas;
- Reducing irrational consumption of heat and electricity at enterprises that was revealed during energy audits;
- development and implementation of innovative technologies and equipment in indoor heating, heating, ventilation and air conditioning systems.

14 Safety and accessibility requirements for use. Durability and maintainability

14.1 Safety of design processes of internal heating, cooling, heating, ventilation and air conditioning systems of buildings and constructions, construction, installation, commissioning, operation is ensured through the establishment of safety-related design values of systems parameters and quality characteristics throughout the life cycle of the building or structure, the implementation of these values and characteristics in the construction, reconstruction, overhaul and maintenance of such parameters

14.2 In the designs of heating, ventilation and air conditioning systems of buildings should include technical solutions to ensure the availability and maintainability of internal heating, heating, ventilation and air conditioning systems to determine

actual values of their parameters and other characteristics, as well as parameters of materials, products and devices affecting the safety of the building or structure during its construction and operation.

14.3 The temperature of the heating medium for internal heating systems in industrial buildings should be taken at least 20 °C below the auto-ignition temperature of the substances in the room, and not more than the maximum specified in Appendix B or according to the technical characteristics of the equipment, fittings and piping.

14.4 The surface temperature of accessible parts of heaters, air heaters, and pipelines of internal heating and heating systems shall not exceed the maximum allowable temperature according to Appendix B, taking into account the purpose of the premises in residential, public, administrative buildings or categories of industrial premises in which they are located.

Protective guards for heating devices and pipelines in buildings of preschool educational organizations, stairwells and lobbies should be provided for heating devices and thermal insulation of pipelines.

14.5 The method of laying pipelines of heating systems must ensure easy replacement of them during repairs. It is allowed to lay insulated pipelines in the fences.

It is not allowed to monolith the pipelines of heating systems in the outer building envelopes.

Cast-in-place pipes without protective casing in building structures (except exterior) are allowed in buildings with a service life of less than 20 years with a design service life of 40 years or more.

14.6 Laying of plastic pipes should be concealed: in the preparation of the floor (in insulation or corrugated pipe), behind plinths and screens, in fines, shafts and channels.

In the case of concealed laying of pipelines should provide access to the locations of demountable connections and fittings.

Open laying of polymeric pipelines is allowed in places that exclude mechanical and thermal damage to the pipes, as well as direct exposure to ultraviolet radiation.

For underfloor heating plastic pipes should be laid without corrugated pipe.

In systems with plastic pipes, connectors and fittings of the same manufacturer should be used.

14.7 Polymeric pipes should be laid in protective cases made of non-combustible materials in places where mechanical damage may occur (under

sills, at the joints of floor slabs, at the intersection of ceilings, internal walls and partitions, etc.).

It is not allowed to lay pipes made of polymeric materials in the premises of category G, as well as in rooms with sources of thermal radiation with a surface temperature over 150 C.

14.8 Caulking gaps and openings at the intersections of pipelines of enclosing structures should be provided with non-combustible materials, ensuring the rated fire resistance limit of the crossed structures.

Fire resistance limits of intersections of building structures by pipelines made of polymeric materials should be determined by the current regulatory documents.

14.9 The distance (in light) from the surface of pipelines, heaters and air heaters with a coolant temperature above 100 °C to the surface of the structure made of combustible materials should be at least 100 mm. If the distance is shorter, the surface of the structure should be thermally insulated with non-combustible materials.

14.10 Thermal insulation of heating and ventilation equipment, pipelines of internal heating and cooling systems, air ducts, flues and chimneys should be provided for:

- burn prevention;
- ensuring acceptable heat (cold) losses;
- to prevent condensation;
- avoid freezing of the coolant in pipelines laid in unheated rooms or in artificially cooled rooms;
- to ensure explosion and fire safety.

The surface temperature of the thermal insulation should not exceed 40 °C. Pipelines of internal heating and cooling systems, heating, laid through the territory of built-in underground parking lots should be insulated with thermal insulation materials of combustibility group NG or G1.

14.11 Hot surfaces of heating and ventilation equipment, pipelines, air ducts, chimneys and flues located in rooms where they pose a risk of ignition of gases, vapors, aerosols or dust should be insulated, providing the temperature on the surface of the thermal insulation structure according to 14.3.

Heating and ventilation equipment, piping and air ducts should not be placed in these rooms if there is no technical possibility of reducing the surface temperature of the thermal insulation to the specified level.

14.12 Thermal insulation structures should be provided according to

MSN 4.02-03.

The design of the insulation must provide for:

- no condensation on the internal surfaces;
- protecting the insulation from damage;
- the possibility of cleaning the air ducts;
- Minimizing the harmful effects of production and replacement parts on the environment.

Internal duct insulation for outdoor return and supply air is not permitted.

14.13 The use of gas-consuming equipment (infrared gas emitters, heat generators, etc.) in the internal heating systems of buildings of various purposes must comply with the requirements of 6.4.12 - 6.4.14 and Appendix B.

14.14 Heating and ventilation equipment, pipelines and air ducts in rooms with a corrosive environment, as well as those designed to remove air with a corrosive environment, should be provided with corrosion-resistant materials or with protective coatings against corrosion. For corrosion protection of air ducts (except for air ducts with the rated fire resistance limits) it is allowed to use painting from combustible materials with a thickness not exceeding 0.2 mm.

14.15 For residential multifamily, public, administrative and domestic and industrial buildings, the service life of heating devices and equipment should be at least 25 years.

Scheduled replacement of equipment is allowed, taking into account the established service life.

14.16 When using decorative screens (grilles) at heating devices, you should provide access to the heating devices for their cleaning.

14.17 Integrated heating elements may not be placed in single layer exterior or interior walls and partitions.

Built-in water or electric heating elements may be provided in the outer multi-layer walls, as well as in the floors and ceilings.

14.18 The average surface temperature of building structures with built-in heating elements under design conditions should be taken no higher than, °C:

40 - for walls;

29 - for the floors of rooms with permanent residence;

23 - for the floors of buildings of preschool educational organizations;

31 - for the floors of rooms with a temporary stay of people, as well as for

bypass paths, benches of indoor swimming pools; by calculation

- for ceilings according to 5.8.

Floor surface temperature along the axis of the heating element in buildings of pre-school educational organizations, residential buildings and swimming pools must not exceed 35 °C.

Floor surface temperature limits do not apply to single heating pipes built into the floor or floor.

Allowed the formation of boundary zones (outside the zones of permanent stay of people) along the outer fences up to 1 m wide with a temperature of the floor surface up to 35 ° C.

14.19 Air-air and gas-air heat exchangers should have a supply air pressure greater than that of the air or gas to be exhausted at the connection points of the air ducts. In air-air or gas-air heat exchangers, the transfer of hazardous substances due to the design of the unit must be taken into account.

14.20 When using heat (cold) ventilation air containing deposited dust and aerosols, air purification to permissible concentrations for heat recovery equipment should be provided, as well as cleaning of heat exchange surfaces from contamination.

14.21 In RE heat utilization systems, measures should be taken to protect the intermediate coolant from freezing and formation of ice on the heat exchange surface of heat recovery units.

14.22 Ducts with the rated fire resistance limits (including thermal protection and fire retardant coatings in their structures) must be made of non-combustible materials. In this case, the thickness of sheet steel for air ducts should be calculated, but not less than 1.8 mm. Non-combustible materials should be used to seal detachable joints of such structures (including flanges). Designs of ducts with the rated fire resistance limits at a temperature of transported gas over 100 ° C except for ducts laid in common shafts and connected by branches to the floor, including prefabricated ducts should be provided with compensators of linear thermal expansion. Elements of fixing (suspension) structures of air ducts should have fire resistance limits not less than those specified for air ducts (by specified numerical values, but only by loss of bearing capacity) within the served fire compartment and not less than those specified for building structures, to which the ducts are fixed, outside the served fire compartment.

14.23 Bellows expansion joints installed in public areas must be fitted with an outer protective cover. The outer protective cover of the bellows expansion joint must be made of stainless steel. The protective cover must be fitted with condensate drainage holes where it is connected to the expansion joints.

An outer protective cover is not necessary for expansion joints installed in enclosed building shafts.

When installing expansion joints in enclosed building shafts, inspection hatches must be installed to allow inspection and replacement of the expansion joint.

The use of single-layer expansion joints and expansion joints without bellow stabilizer is not permitted.

The minimum installation temperature of the bellows expansion joint must be at least - 10^{O} C.

The axial travel of the compensator in compression must be greater than the maximum thermal elongation of the section to be compensated. The axial movement of the compensator during elongation must be at least 30% of the axial movement during compression.

The FBR of a bellows expansion joint at full axial travel must comply with 5,000 cycles of actuation.

For quality control purposes, it is recommended that large customers conduct random checks on the UBD of compensators from their own stock. Recommended frequency of inspections: 2 compensators once every six months.

14.24 Pipelines at the intersection of ceilings should be laid in sleeves made of non-combustible materials. The edges of the sleeves must be at the same level as the surfaces of the ceilings and not less than 30 mm above the surface of the clean floor.

Drainage pipelines made of polymeric pipes at intersections of fire floors should be laid with the use of fire self-expanding sleeves (sleeves).

Sealing of gaps and openings in places where pipelines are laid should be provided with non-combustible materials, ensuring the rated fire resistance limit of the crossed enclosures.

14.25 It is not allowed to use the assembly of critical assemblies and equipment from components and elements (pressure maintenance stations, pumping stations, refrigeration machines, etc.) without testing and testing in the factory conditions and issuing appropriate documents for the finished product.

15 Procedure for installation and commissioning of internal water supply and sanitation systems (including testing, testing, commissioning and inspection)

15.1 Installation of indoor heating and cooling, heating, ventilation and air conditioning systems must be carried out in strict accordance with the design documentation for the construction of the facility.

15.2 General guidelines for project documentation should include:

- operational requirements for the building or structure to be designed (if necessary);

- the list of works that affect the safety of the building or structure and for which it is necessary to draw up certificates of certification of hidden works, critical structures, sections of internal heat and cold supply, heating, ventilation and air conditioning systems.

15.3 Requirements for and forms of acts (installation works, hydraulic tests of indoor heating and cooling, heating, ventilation and air conditioning systems are listed in the current regulatory documents.

15.4 The composition of the commissioning work and the program of their implementation must comply with the rules of health and safety, fire safety.

15.5 Equipment defects detected in the course of individual tests and comprehensive testing of the equipment, as well as commissioning work, must be eliminated in accordance with the requirements in the current regulatory documents.

15.6 Comprehensive testing of equipment for indoor heating and cooling, heating, ventilation and air conditioning systems is carried out in accordance with the requirements in the current regulatory documents.

16 Rules of operation of heating, ventilation and air conditioning systems

16.1 The building or structure and its internal heating, cooling, heating, ventilation and air conditioning systems must be designed and constructed so that during the operation of the building or structure, safe conditions for human habitation and stay are ensured according to the following indicators:

- air quality in residential, public and other premises of buildings and

structures and in the working areas of industrial buildings and structures;

- protection against noise in the rooms of residential and public buildings and in the working areas of industrial buildings and facilities;

- room microclimate;

- level of noise and vibration in the premises of residential and public buildings and the level of noise and technological vibration in the working areas of industrial buildings and structures;

Buildings and structures must be designed and constructed in such a way as to ensure the efficient use of energy resources in the course of their operation.

16.2 The project documentation must provide for:

a) the possibility of safe operation of the designed buildings or structures and the internal heating and cooling, heating, ventilation and air conditioning systems included in them, as well as requirements for the methods of maintenance activities, in carrying out which there is no threat of violation of the safety of building structures, engineering networks and systems of engineering and technical support or unacceptable deterioration of the parameters of human habitat;

b) the minimum frequency of checks, inspections and examinations of the state of the internal heating and cooling, heating, ventilation and air conditioning systems of buildings or structures and (or) the need to monitor the environmental components, the state of the internal heating and cooling, heating, ventilation and air conditioning systems in the operation of buildings or structures;

c) information for users and maintenance services on the values of operational loads on building structures, engineering networks and systems of engineering and technical support, which must not be exceeded during the operation of the building or structure;

d) information on the location of hidden connections, pipelines and other devices of internal heating and cooling, heating, ventilation and air conditioning systems, damage to which leads to a threat of harm to the life and health of people, property of individuals or legal entities, state or municipal property, the environment, life and health of animals and plants.

16.3 The design documentation should be used as the main document in making decisions to ensure the safety of buildings or structures and the engineering systems included in them at all subsequent stages of the life cycle of the building or structure.

Appendix A

Calculation of thermal loads on heating and ventilation systems

A.1 Heat consumption (heat load) for heating and ventilation $^{p}{}_{ov}$ for the most adverse conditions are determined taking into account 5.1 of the formula:

$$^{p}{}_{ov}\sum ({}_{тр} \quad {}_{n} \quad {}_{ventp} \quad {}_{infp} \quad {}_{mtsp} \quad {}_{life} \quad \Pi) \qquad (A.1)$$

where$_{тр\ n\ is}$ the transmission heat loss required to compensate for the heat transfer through the enclosing structures *of the nth* room of the building, determined in accordance with A.2, W;

$_{вент\ n}$ is the heat consumption needed to heat the required amount of supply air for *the nth* room of the building, determined in accordance with A.3, W;

$_{инф\ n\ is\ the}$ infiltration heat loss due to the air permeability properties of the enclosing structures *of the nth* room of the building, determined in accordance with A.5, W;

$_{мтс\ n}$ is the heat consumption for heating materials, equipment and vehicles brought into the *n-th* room of the building, determined in accordance with A.6, W;

$_{быт\ n\ is}$ the residential heat inputs *of the n-th* room of the building, typical for the design mode (for the most unfavorable conditions), W.

N o t e - Only those heat inputs that occur in the design mode are considered as domestic heat inputs: heat flows from continuously operating electrical appliances, lighting, pipelines and other heat sources, as well as from people present in the room in question in the design mode.

A.2 The transmission heat losses *of the n-th* room$_{тр\ p}$ should be determined by the formula (A.2) or (A.3)

$$Qtr_{n}\ tv_{n}\ tn\ nt_{,i}Ai_{Ki};_{i} \qquad (A.2)$$

$$Qtr\ t \quad t\ n\ A\ U\ n \quad L\psi n \quad N\chi, \qquad (A.3)$$

$$n \quad {}_{at\ n} \quad {}_{н} \quad {}_{ijk} \quad t,i \quad ii \quad t,j \quad jj \quad t,k \quad k\kappa$$

where$_{в}$ is the design indoor air temperature *of the n-th* room, determined in accordance with 5.1, °C;

$_{н}$ - design outdoor air temperature, °C;

-heat transfer coefficient *i-th building* or a fragment of a building envelope, W/(m^2 °C), determined by the formula

$$i \quad \frac{1}{tr_{0,i}}, \qquad (A.4)$$

where $_{0,i}^{тр}$ -adjusted heat transfer resistance *of the i-th fragment* of the thermal protection envelope of the building under consideration, determined in accordance with Annex E of SNiP 23-01, SP 23-101 and MSN 2.04-02 (m^2 ° C)/W;

A_i - area of *the i-th* building envelope or fragment of the building envelope) of the room in question, m^2 ;

$n_{t,i}$ - coefficient that takes into account the temperature of the space behind the envelope in question;

U_i - heat transfer coefficient of the uniform part of the *i-th* fragment of the enclosing structure, determined in accordance with SNiP 23-01, SP 23-101 and MSN 2.04-02, W / (m^2 ° C);

L_j - the length of *the j-th* linear thermal conductive inclusion of *the n-th* room, m;

N_k - the number of k-point thermal inclusions of *the n-th* room, pcs.

- is the specific heat loss through the linear inhomogeneity of the j-th kind, determined by calculating the temperature fields, W/(m °C);

- specific heat loss through the point heterogeneity of the k-th type, determined by calculating the temperature fields, W/°C.

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1 In accordance with 6.2.2, the calculation of transmission heat losses through internal building envelopes is performed only if the air temperature difference in the rooms shared by such internal building envelope is more than 3 ° C.

In this case, the calculation is carried out according to the formula similar to (A.2) or (A.3), but in this case:

- The influence of thermal inhomogeneities characteristic of internal structures can be neglected;
- instead of the outside air temperature, take into account the air temperature of the room located behind the inner envelope in question;
- for the room behind the interior envelope in question, consider the corresponding transmission heat gains (i.e., transmission heat losses through the interior envelope in question, taken with an inverse sign).

2 The area of the outer and inner enclosing structures when calculating heat loss is calculated with an accuracy of 0.01 m^2 , using the dimensions of the enclosures, m, measured with an accuracy of 0.01 m. The lengths of linear thermo-technical elements are determined with an accuracy of 0.1 m. The number of point thermo-technical elements is determined with an accuracy of whole units.

3 In the case of the elemental approach, i.e., when considering sets of linear and point heat inhomogeneities individually on the premises, the areas of the enclosing structures are determined by their internal surfaces.

4 Areas of windows, stained glass windows, balcony doors, exterior doors and skylights are measured by the smallest building opening.

5 When taking into account the additional heat losses through parts of the outer envelopes located behind the heaters, as well as due to cooling of the coolant in the pipelines laid in unheated rooms, they in total should not exceed 7% of the heat flow of the heating system of the building.

A.3 Heat consumption for ventilation *of the n-th* room$_{вент\ p}$, W, is determined by the value of the required supply (outdoor) air flow for the cold period of the year according to the formula (A.5)

$$вент\ _{п}\ (\ вн\ )\ _{пв}\ ,\ (\ вн\ )\ _{пнв}\ ,\ , \qquad (A.5)$$

where$_{в}$ is the same as in A.2;

$_{н}$ - the same as in A.2;

$_{п}$ - is the required mass flow rate of supply air required to ventilate *the n-th* room, kg/h;

$_{в}$ - specific mass heat capacity of air, equal to 1 kJ/(kg °C); 0.28 - conversion factor;

$_{п}$ - is the required volume flow rate of supply air required to ventilate *the nth* room, determined in accordance with A.4, m^3 /h;

$_{н}$ - supply air density at the temperature corresponding to the design mode, determined by the formula (A.6), kg/m^3

$$\overline{\ }_{н} \quad \cdot \ _{н} \qquad (A.6)$$

A.4 Supply air flow rate required for ventilation *of the* i-room,$_{п}$, m^3 /h, is taken according to the standard ratios, the rate of air supply per person or determined by calculation in accordance with c. 7.4.1.

A.5 Heat consumption for heating the infiltrated air *of the i-th* room $_{инф\ p}$, W, are determined by the formula:

$$инф\ _{п}\ (\ вн\ )_{инф\ п}{}_{в}\ ,\ , \qquad (A.7)$$

Where$_{в}$ is the same as in A.2;

$_{н}$ - the same as in A.2;

$_{инф\ n\ is\ the}$ calculated mass flow rate of air infiltrating into *the nth* room, determined by the formula (A.8), kg/h;

$_{в}$ - the same as in A.5; 0.28

the same as in A.3.

N o t e - If the room in question has a design air overpressure in the organized ventilation systems (overpressure higher than the atmospheric pressure or the pressure in the neighboring rooms) due to

The amount of supply air exceeding the amount of exhaust air is not taken into account in the infiltration heat losses. In this case, the amount of supply air that provides this support must be taken into account when calculating the heat consumption for ventilation

The amount of air entering *the n-th* room as a result of infiltration through the enclosing structures$_{инф\ p}$, kg/h, should be determined by the formula (A.8)

$$G_{infra} = \frac{\Delta P_n^{2/3}}{\Delta PR_{1i}\Delta PR_{and,1i}} \frac{A_{1i}}{\nu_{1\varphi}} \frac{\Delta P_0^{1/2}}{A_{and,1j}}, \quad (A.8)$$

where ΔP_n is the calculated pressure difference at the outer and inner surfaces of the enclosing structure *of the n-th* room;

ΔP_0 - standard air pressure difference at the external and internal surfaces of the enclosing structure, at which the air permeability properties are tested, equal to 10 Pa;

A_{1i} - area of 1i-th translucent enclosing structure of the considered room, m^2 ;

A_{1j} - area of the 1jth air permeable enclosing structure of the room in question, m^2 ;

$R_{u,1i}$ - air permeability resistance of the enclosing structure of the 1i-th type of the considered room, m^2 -h-Pa /kg;

$R_{u,1j}$ - air permeability resistance of the enclosing structure of the 1j-th type of the considered room, m^2 -h-Pa /kg;

2/3 and 1/2 - index of air permeable structure, taken for windows and translucent enclosing structures equal to 2/3, for the entrance doors to the built-in rooms, entrance doors and gates to buildings or structures, as well as for openings - equal to 1/2.

The difference between the air pressure on the external and internal surfaces of the enclosing structures ΔP_n , Pa, should be determined by the formula:

( ) (н) (— н з) (в , (A.9)

в

where *H* - the height of the building (from the floor level of the first floor to the top of the exhaust shaft), m;

- distance from the floor level of the first floor to the center of the envelope in question, m;

g = 9.81 m/s² acceleration of free fall;

в - the same as in A.3;

н - density of outside air, kg/m^3 , determined by the formula (A.6);

- estimated wind speed in the cold period of the year;

н and з are aerodynamic coefficients respectively for windward

and leeward surfaces of the building envelopes, taken according to SNiP 2.01.07. For buildings of rectangular shape$_{н}$ is taken equal to 0.8;$_{з}$ = minus 0.6;

$_{(\ )}$ -coefficient of wind speed change calculation depending on the height of the building, taken according to SNiP 2.01.07;

$_{в}$ - conditional pressure in the room, Pa, from the level of which the first and second terms of formula (A.9)

If there is no organized ventilation in the room $_{в}$, Pa, is determined by the formula

$$\frac{(_{n\,in})_{in}}{on}\left(\quad\frac{}{}\quad{}_{з}\quad{}_{(\ )}\right) \qquad (A.10)$$

For rooms with balanced supply and exhaust ventilation, the value$_{инф\ n}$ is neglected.

A.6 Heat loss due to the need for heating of materials, equipment and vehicles brought into *the n-th* room of the building, W, are determined by the formula

$$_{mtsp}(_{in\ mtsp})_{mtsp}\sum(_{in\ mtsp})_{mtsp}. \quad (A.11)$$

where$_{мтс\ p-}$ the heat loss due to the need for heating of materials brought into the *n-th* room of the building, W;

$_{мтс\ n-}$ specific heat demand generated by the need to heat materials, equipment or vehicle brought into the *n-th* room of the building, W/°C;

$_{в}$ - the same as in A.2;

$_{мтс}$ - temperature of *the m-th* material, equipment or vehicle entering the room in question, °C.

For vehicles and metal materials$_{мтс}$ is taken as $_{н}$ for other materials$_{мтс}$ is taken as$_{н}$ +10 °C, where$_{н}$ is the same as in A.2;

$_{мтс}$ - mass of *the m-th* material, equipment or vehicle brought into the room in question, kg;

$_{мтс}$ - Specific heat capacity of material, equipment, or transport means of *the m-th* species introduced into the room in question, kJ/(kg °C).

β - coefficient, taking into account the intensity of heat absorption during the first hour. For vehicles is taken equal to 0.6; for bulk materials - 0.5; for bulk materials - 0.4.

Appendix B

Requirements for heating systems and internal heating of buildings for various purposes

Table B.1

Name of the room	Heating system (heat supply), heating devices, heating medium, maximum permissible temperature of the heating medium or heating surface
B.1 Residential, public and office buildings (other than those listed in B.2) - B.10 of this table)	Horizontal water with plastic piping, radiators or convectors at a coolant temperature not exceeding 90 °C. As an exception, water riser with metal piping, radiators, panels or convectors at the temperature of the coolant for two-pipe systems - not more than 95 ° C; for one-pipe - not more than 105 ° C . Underfloor heating. Air. Electrical with a temperature on the heat emitting surface of devices not exceeding 90 °C or on heated surfaces with a temperature according to clause 14.18
B.2 Preschool educational organizations, including stairwells and lobbies	Horizontal water with plastic piping, radiators or convectors at a coolant temperature not exceeding 80 °C. As an exception, water riser with metal piping, radiators, panels or convectors at a temperature on the surface of the piping and heating devices not exceeding 70 °C. Water heating with heating elements made of plastic piping embedded in exterior walls, floors and ceilings at a temperature of the coolant not exceeding 50 °C. Electrical with a temperature on the heat emitting surface of devices not exceeding 70 °C or on heated surfaces with a temperature according to clause 14.18
B.3 Rooms, operating rooms and other therapeutic rooms in hospitals (except psychiatric and drug treatment rooms)	Horizontal water with plastic piping, radiators or convectors at a coolant temperature not exceeding 85 °C. As an exception, water riser with metal piping, radiators, panels and convectors at a coolant temperature not exceeding 85 ° C. Water heating with heating elements made of plastic piping embedded in exterior walls, floors and ceilings at a temperature of the coolant not exceeding 50 °C

Continued Table B 1

Name of the room	Heating system (heat supply), heating devices, heating medium, maximum permissible temperature of the heating medium or heating surface
B.4 Wards, other rooms Therapeutic rooms in psychiatric and narcological hospitals	Horizontal water with plastic piping, radiators or convectors at a coolant temperature not exceeding 90 °C. As an exception, water riser with metal piping, radiators, panels or convectors at a coolant temperature not exceeding 95 °C. Water heating with heating elements made of plastic piping embedded in exterior walls, floors and ceilings at the temperature of the coolant not exceeding 50. Electrical with a temperature on the heat emitting surface of devices not exceeding 70 °C or on heated surfaces with a temperature according to clause 14.18
B.5 Sports halls	Air Horizontal water with plastic piping, radiators or convectors at a coolant temperature not exceeding 90 °C. Water riser with metal piping, radiators, panels or convectors at a coolant temperature not exceeding 95 °C. Water heating with heating elements made of plastic piping embedded in the outer walls, floors and ceilings at a temperature of the coolant not exceeding 50 ° C. Electric or gas with HII
B.6 Baths, Laundries and Showers	Horizontal water with plastic piping, radiators or convectors at a coolant temperature not exceeding 90 °C. Water riser with metal piping, radiators, panels or convectors at a coolant temperature not exceeding 95 °C. Water heating with heating elements made of plastic piping embedded in exterior walls, floors and ceilings at a temperature of the coolant not exceeding 50 °C. Air

Continued Table B 1

Name of the room	Heating system (heat supply), heating devices, heating medium, maximum permissible temperature of the heating medium or heating surface
B.7 Catering establishments (other than restaurants) and sales areas (other than those specified in B.8)	Horizontal water with plastic piping, radiators or convectors at a coolant temperature not exceeding 90 °C. Water riser with metal piping, radiators, panels or convectors at a coolant temperature not exceeding 95 °C. Water heating with heating elements made of plastic piping embedded in exterior walls, floors and ceilings at the temperature of the coolant not exceeding 50. °C Air. Electrical with a temperature on the heat emitting surface of the devices not exceeding 90 °C or on the heated surfaces with a temperature according to clause 14.18. Electric or gas with HII in uninsulated and semi-open rooms and buildings
B.8 Sales areas and rooms for handling and storage of materials or containing flammable liquids	Take as listed in a) or b) B.11 of this table
B.9 Passenger halls of stations, airports	Air (according to 7.1.15 - 7.1.17). Horizontal water with plastic piping, radiators or convectors at a coolant temperature not exceeding 90 °C. Water riser with metal piping, radiators, panels and convectors at a coolant temperature not exceeding 95 °C. Water heating with heating elements made of plastic piping embedded in the outer walls, floors and ceilings at a temperature of the coolant not exceeding 50 °. Electrical with a temperature on the heat emitting surface of devices not exceeding 90 °C or on heated surfaces with a temperature according to p.14.18
B.10 Auditoriums and restaurants	Horizontal water with plastic piping, radiators or convectors at a coolant temperature not exceeding 90 °C. Water riser with metal piping, radiators, panels or convectors at a coolant temperature not exceeding 95 °C. Water heating with heating elements made of plastic piping embedded in exterior walls, floors and ceilings at a temperature of the coolant not exceeding 50 °C. Air. Electrical with a temperature on the heat emitting surface of devices not exceeding 90 °C or on heated surfaces with a temperature according to p. 14.18

Continued Table B 1

Name of the room	Heating system (heat supply), heating devices, heating medium, maximum permissible temperature of the heating medium or heating surface
B.11 Production and Storage: a) categories B1 - B4 without dust and aerosol emissions or with emissions of non-combustible dust	Air. Water and steam at coolant temperature: water not more than 115 °C, steam not more than 130 °C. Electric or gas (except for storages of categories B1 - B4) at a temperature on the heat emitting surface not exceeding 90 °C. Electric or gas with GII for premises of fire hazard classes F5.1 and F5.2 relating to categories B2, B3, B4 with the location of the GII outside hazardous areas
b) categories A, B, B1 - B4 with the release of combustible dust and aerosols	Water or steam at a temperature of the coolant: water not more than 115 ° C, steam not more than 130 ° C or air, and the heat generating devices of these systems should be placed outside the served premises of category A and B, and on the air duct system air heating system when they cross the enclosing structures of these premises, should be provided installation of normally open fire dampers with fire resistance rating of EI 15. Electric or gas for premises of categories B1 - B4 (except for warehouses of categories B1 - B4) at a temperature on the heat emitting surface not exceeding 115 °C. Electrical for premises of categories A and B (except for warehouses of categories A and B) in explosion-proof version at a temperature on the heat emitting surface not exceeding 110 °C
c) categories G and D without dust and aerosol emissions	Air. Water or steam with finned tubes, radiators and convectors at the coolant temperature: water not more than 115 °C, steam not more than 130 °C. Water heating with heating elements made of plastic piping embedded in exterior walls, floors and ceilings at a temperature of the coolant not exceeding 50 °C. Electric or gas with HII
d) categories D and D with increased requirements for air purity	Air. Water with radiators (without fins), panels or smooth pipes at a coolant temperature not exceeding 115 °C. Water heating with heating elements made of plastic piping embedded in exterior walls, floors and ceilings at a temperature of the coolant not exceeding 50 °C
e) categories G and D with the release of non-combustible dusts and aerosols	Air. Water or steam with radiators at the temperature of the coolant: water not more than 115 °C, steam not more than 130 °C. Water heating with heating elements made of plastic piping embedded in exterior walls, floors and ceilings at a temperature of the coolant not exceeding 50 °C. Electric or gas with HII

Continued Table B 1

Name of the room	Heating system (heat supply), heating devices, heating medium, maximum permissible temperature of the heating medium or heating surface
f) categories G and D with the release of combustible dust and aerosols	Air. Water and steam with radiators or smooth pipes at the temperature of the coolant: water not more than 115 °C, steam not more than 130 °C. Water heating with heating elements made of plastic piping embedded in exterior walls, floors and ceilings at a temperature of the coolant not exceeding 50 °C
g) categories D and D with significant moisture loss	Air. Water or steam with radiators, convectors or finned tubes at the temperature of the coolant: water not more than 115 °C, steam not more than 130 °C
(i) with the release of combustible toxic substances	According to the regulatory documents
B.12 Stairwells, crosswalks and lobbies	Water with radiators, convectors or calorifiers at the temperature of the coolant: water not more than 95 °C. Air
B.13. Separate rooms and workplaces in unheated and heated rooms with air temperature below the rated temperature (except rooms of categories A, B and C)	Electric or gas with HII
B.14. Premises of entertainment and cultural and educational institutions of class F2.3 (theaters, cinemas, concert halls, sports facilities with stands), class F2.4 (museums, exhibitions, dance halls) with a calculated number of seats for visitors and **located outdoors**	Electric or gas with HII

End of table B 1

Name of the room	Heating system (heat supply), heating devices, heating medium, maximum permissible temperature of the heating medium or heating surface
P a g e 1 The air temperature for the calculation of air heating systems combined with supply ventilation or air conditioning should be determined in accordance with the requirements of 7.1.20. 2 For internal heating systems given in B.11 it is allowed to use steam with a temperature of up to 200^{O} C by the conditions of heat supply from sources of the site for the calorifiers of supply systems, installed in ventilation chambers, without access by unauthorized persons. 3 Heating systems of buildings, including apartment buildings with gas heat generators should be used taking into account the requirements of regulatory documents on fire safety according to the Law of the Kyrgyz Republic "On Fire Safety. 4 The use of gas-using equipment (infrared gas emitters, heat generators, etc.) in heating systems of buildings of various purposes must comply with the requirements of SN KR 42-01. The surface temperature of low-temperature radiant heating panels should not be taken above 60 ° C. The surface temperature of radiant heating devices should not be taken above 250 ° C. Gas emitters are allowed to use if the combustion products are removed outside, ensuring MPC of harmful substances in the air of the working or service area below the permissible values, as well as under the condition of installation of methane and carbon monoxide alarms in accordance with 6.4.13. 5 Heating with gas appliances in buildings of III, IV and V degrees of fire resistance is not allowed. 6 Electric heating with a temperature at the heat emitting surface is allowed The temperature of the devices does not exceed 70 °C in buildings of rapidly erecting structures.	

Appendix B

Minimum outdoor air consumption per person

Table B.1 establishes outdoor air supply rates for people staying indoors for more than 2 hours continuously.

Table B .1

Premises	Indoor air flow rate, m^3 /h	
	with natural ventilation	without natural ventilation
Production	30	60
Public and administrative and amenity [1)]	40	60 20 [2)]
Living with the total area of the apartment per person		
over 20 m^2	30 [3)]	45
less than 20 m^2	3 m^3 /h per 1 m^2 of living space	-

[1)] Outdoor air consumption is given for offices, offices of public buildings for administrative purposes. In other public spaces, the outdoor air flow rate should be taken in accordance with the requirements of the relevant regulations.

[2)] For rooms in which people are not more than 2 hours continuously (cinemas, theaters, etc.).

[3)] 30 m^3 /h per resident or 0.35 air change per hour, determined by the total volume of the apartment.

Appendix D
Calculation of supply air flow in central ventilation and air conditioning systems

D.1 Supply air flow rate , m^3 / h, for the ventilation and air conditioning system should be determined by calculation and take the higher of the costs required to ensure:

- of sanitary and hygienic norms according to the formula (D.1);
- of explosion and fire safety standards according to the formula (D.2);
- conditions that exclude condensation in accordance with formula (D.3).

D.2 The air flow rate should be determined separately for warm and cold seasons and transient conditions based on heat and moisture assimilation and on the mass of emitted harmful or explosive substances, taking the larger of the values obtained by formulas (D.1) - (D.7) (with the density of supply and exhaust air equal to 1.2 kg/m^3):

a) by excess apparent heat at the value of the angular coefficient of the process ray in the room more than 40,000 kJ/kg is determined by the formula

$$\text{w,}z \frac{\text{-,-}c\text{,}(t\text{,-}tin)}{c(tl\text{-}tin)}. \qquad \text{(D.1)}$$

For rooms with heat and moisture emission, if the value of the angular coefficient of the process ray in the room is less than 40,000 kJ/kg, the air flow rate should be calculated according to the formula (D.3) or (D.4).

Heat flow into the room from direct and scattered solar radiation should be taken into account in the device:

- ventilation, including evaporative air cooling - for the warm period of the year;
- air conditioning - for warm and cold periods of the year and for transient conditions;

b) by the mass of emitted harmful or explosive substances

$$\text{w,}z \frac{\text{0-}\text{,}(q\text{,-}qin)}{q1\text{-}qin} \quad ; \qquad \text{(Г.2)}$$

If several hazardous substances with a summation effect are released into the room simultaneously, the air exchange rate should be determined by summing the airflow rates calculated for each of these substances:

c) by excess moisture (water vapor)

$$\text{w,} \frac{-\text{pв}\text{,}(d\text{,-}din)}{\text{pb}(ddl\text{-}din)}; \qquad \text{(D.3)}$$

For rooms with excessive moisture, check that there is sufficient air exchange to prevent condensation on the interior

surface of external enclosing structures at design parameters B outside air in the cold period of the year:

d) by excess total heat

$$L_{w,z} = \frac{Q - \rho_B \cdot c \cdot (t_{w,z} - t_{in})}{\rho_B \cdot c \cdot (I_{w,z} - I_{in})}; \quad (Г.4)$$

e) by the rated air exchange rate:

; (Г.5)

f) by the normative specific flow rate of supply air:

; (Г.6)

(Г.7)

In formulas (D.1) - (D.7)

$L_{w,z}$ - is the flow rate of air removed from the serviced or working area of the room by local suction systems and for process needs, m^3 /h;

Q, $Q_{h,f}$ - excess apparent and total heat fluxes in the room, assimilated by the air of central ventilation systems and air conditioning systems, W;

ρ_B - air density, kg/m^3 ;

c - specific volumetric heat capacity of air, equal to 1.2 kJ/(m^3 -°C);

$t_{w,z}$ - temperature of air removed by local exhaust systems from the serviced or working area of the room and for technological needs, °C;

- temperature of air removed from the room outside the served or working area, °C;

t_i - temperature of the air supplied to the room, °C;

- excess moisture in the room assimilated by the air of the central ventilation and air conditioning systems, g/h;

$d_{w,z}$ - moisture content of the air removed from the serviced or working area of the room by local suction systems, and for process needs, g/kg;

- moisture content of the air removed from the room outside of the serviced or working area, g/kg;

d_i - moisture content of the air supplied to the room, g/kg;

$I_{w,z}$ - specific enthalpy of air removed from the served or working area of the room by local suction systems, and for process needs, kJ/kg;

- specific enthalpy of air removed from the room outside the served or working area, kJ/kg;

I_i - specific enthalpy of air supplied to the room, kJ/kg, determined taking into account the temperature increase;

$_0$ - flow rate of each of the harmful or explosive substances entering the room air, mg/h;

$_{w,z}$ is the concentration of a hazardous or explosive substance in the air removed respectively from the serviced or working area of the room and outside it, mg/m^3 ;

$_i$ - concentration of a hazardous or explosive substance in the air supplied to the room, mg/m^3 ;

V_P - volume of the room, m^3 (for industrial premises with a height of 6 m or more, V_P = 6 *A,* for residential and public buildings with a height of 4 m or more, V_P = 4 *A)*;

A - area of the room, m^2 ;

N - the number of people (visitors), jobs, equipment;

n is the normalized rate of air exchange, h^{-1} ;

k - normalized supply air flow rate per 1 m^2 of the room floor, m^3 /(h-m^2);

m - the rated specific flow rate of supply air per 1 person, m^3 /h, per workplace, per visitor (see Appendix B) or unit of equipment.

Air parameters$_{w,z}$,$_{w,z}$,$_{w,z}$ should be taken equal to the calculated parameters in the served or working area of the room according to Section 5, and$_{w,z}$ - equal to MPC in the working area of the room.

D.3 Air flow rate for explosion safety standards
should be determined by the formula (D.2).

In this case, in formula (D.2)$_{w,z}$ and should be replaced by 0.1q$_g$, mg/m^3 (where q_g is the lower concentration limit of flame spread in gas, steam and dust-air mixtures).

D.4 Air flow rate , m^3 /h, for air heating not combined with ventilation, should be determined by the formula

$$w \quad \frac{, \quad he}{c(the\text{-}tw,z)} \quad , \qquad (Г.8)$$

where - heat flow for air heating of the room, W;

- the temperature of heated air, °C, supplied to the room, is determined by calculation.

D.5 The air flow rate $_t$ from intermittent ventilation systems with a nominal capacity$_d$, m^3 /h, is given based on , min, interrupted by system operation for 1 hour, according to the formula

$$td \qquad . \qquad (Г.9)$$

Appendix E

Permissible velocity and temperature in the supply air jet

E.1 In the supply air jet at the entrance to the serviced or working area (at workplaces), the maximum air velocity v_x , m/s, should be determined by the formula

$$v_x = K_п \, v_н , \quad (E.1)$$

where $K_п$ is the coefficient of transition from the rated indoor air velocity to the maximum velocity in the air jet, determined according to Table E.1;

$v_н$ - normalized air speed, m/s.

Table D.1

Microclimate parameters	Placement of people	Job category	
		light - Ia, Ib	moderate severity - IIa, IIb, severe - III
Allowable	In the area of direct exposure to the intake air jet within the site:		
	of the initial and in the case of air smothering	1	1
	main	1,4	1,8
	Outside the area of direct exposure to the intake air jet	1,6	2
	In the return air flow area	1,4	1,8
Optimal	In the area of direct exposure to the intake air jet within the site:		
	initial	1	1
	main	1,2	1,2
	Outside the zone of direct exposure to the supply air jet or in the zone of return airflow	1,2	1,2
N o t e - The direct impact zone of the jet is defined by the cross-sectional area of the jet, within which the air velocity varies from $v(x)$ to $0.5v(x)$.			

E.2 The temperature in the supply air stream at the entrance to the serviced or working area (at workplaces) should be calculated:

a) the maximum temperature , °C, when replenishing the lack of heat in the room by the formula

н (Д.2)

b) the minimum temperature , °C , when assimilating excess heat in the room according to the formula

н . (Д.2)

In formulas (E.2) and (E.3):

н - the normalized air temperature, °C, in the serviced area or at workplaces in the working area of the room;

, - allowable deviations of the air temperature, °C, in the supply air jet from the rated air temperature in the served or working area, take according to Table E.2.

Table D.2

Microclimate parameters	Premises	Permissible deviations of air temperature, °C			
		when making up for heat deficiencies in the room Δt_1		in the assimilation of excess heat in the room Δt_2	
		Placement of people			
		in the zone of direct exposure and return flow of the supply jets	outside the zone of direct exposure and return flow of the supply jets	in the area of direct exposure to the intake jet	outside the area of direct exposure to the intake jet
Allowable	Residential, public and administrative and household	3	3,5	1,5	2
	Production	5	6	2	2,5
	Any, with the exception of rooms with special technological requirements	1	1,5	1	1,5

Appendix E

Temperature and air velocity at airborne strangling

TabE .1

Job category	Air temperature outside the jet, °C	Average at 1 m^2 air velocity in the strangling jet at the workplace, m/s	The temperature of the air mixture in the strangling jet, °C, in the workplace at the surface radiant heat flux density, W/m^2				
			140 - 350	700	1400	2100	2800
Light - Ia, Ib	Take according to Table E.2	1	28	24	21	16	-
		2	-	28	26	24	20
		3	-	-	28	26	24
		3,5	-	-	-	27	25
Moderate severity - IIa, IIb		1	27	22	-	-	-
		2	28	24	21	16	-
		3	-	27	24	21	18
		3,5	-	28	25	22	19
Severe - III		2	25	19	16	-	-
		3	26	22	20	18	17
		3,5	-	23	22	20	19

P a g e

1 When the outside air temperature differs from that given in this table, the temperature of the air mixture in the strangling jet in the workplace should be increased or decreased by 0.4 °C for each degree of difference in the value given in this table, but take no less than 16 °C.

2 The surface density of the radiant heat flux should be taken equal to the average for the irradiation time.

3 When the duration of exposure to radiant heat flux less than 15 or more than 30 minutes of continuous operation, the temperature of the air mixture in the shower jet may be taken respectively 2 ° C above or below the values given in this table.

4 For intermediate values of the surface density of the radiant heat flux, the temperature of the air mixture in the strangling jet should be determined by interpolation.

Appendix G

Calculation method of air distribution

G.1 The purpose of calculating the air distribution is to determine the maximum velocity and excess temperature of the supply jet in the served (working) area of the room for comparison with the normative values, according to 5.7.

This goal is achieved by selecting the correct supply air circuit as well as by selecting the correct size and quantity (HP).

The input data for selecting and calculating the BP are:

- type and purpose of the room;
- architectural and design solutions, acoustic characteristics;
- specific heat loads for all periods of the year and modes of operation;
- the rated air parameters in the serviced area, according to 5.1.

G.2 All methods of calculation of air distribution imply preliminary selection of the scheme of supply and the size of air distribution unit, which are specified in the process of calculation of the parameters of the jet. The area of the ventilated room is divided into modules served by each air handler. Module size must ensure uniform distribution of supply air and absence of stagnant zones.

G.3 The most characteristic supply schemes for all classes of HP are shown in figure G.1. All these schemes are suitable for supplying isothermal or chilled air. For ventilation and air-conditioning systems combined with air heating, preference should be given to supplying heated air from top to bottom in inclined or vertical compact or conical clustered jets.

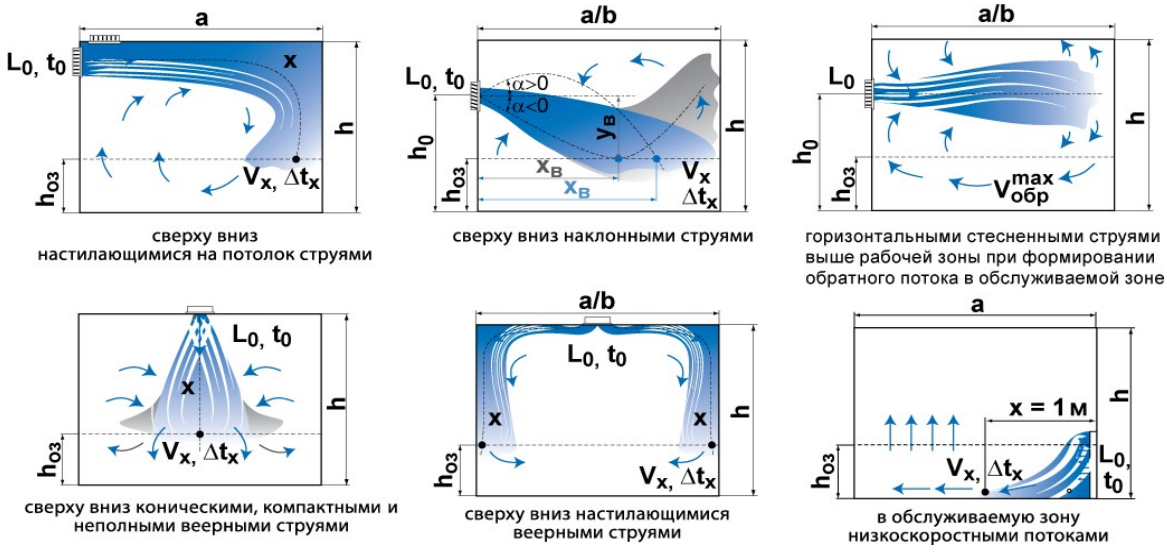

Figure G.1 **- Main schemes of supply air**

G.4 Air supply by ceiling-covered jets

For the formation of the planking strings, the air diffusers are installed on the wall directly below the ceiling.

The calculation is done in the following order:

The calculated length of the jet *x* is determined:

when supplying isothermal air

- (Ж.1)

when supplying chilled air, the calculated length of the jet *x* is determined taking into account the separation from the ceiling

omp - (Ж.2)

where *a* is the length of the room module served by one VR, m;

h - room height, m;

$h_{o.з}$ - height of the serviced or working area, m;

$x_{отр}$ - the distance from the BP to the point of separation of the jet from the ceiling, m, determine:

– *For compact jets*

omp , (Ж.3)

– *for flat and fan jets*

omp , (Ж.4)

where H is the geometric characteristic of the inflow jet, m, determined:

- for compact, conical and fan jets

$$\sqrt{\text{- - }_{0}\text{-}\ \overline{\sqrt{}}_{0}\ \ \overline{}}\ \overline{\sqrt{n\text{-}\Delta t_{0}\ \text{-g}}} \quad \text{(Ж.5)}$$

-for *flat jets*

$$\sqrt{\ \overline{}}\ {}_{0}\ \text{-}\ \ \infty\ \ \frac{(\ 1\text{-}\ {}_{0})\ (n1\text{-}}{\Delta t0\text{-g})^{2}}, \quad \text{(Ж.6)}$$

where *m* is the kinematic (or velocity) coefficient of BP;

m_1 =m/2.45 - kinematic coefficient for the flat section of the jet;

n is the temperature coefficient of BP;

n_1 =n/2.45 - temperature coefficient for the flat section of the jet;

$_0$ - is the area of the design cross-section of the BP;

$_0$- is the width of the design cross-section of BP;

$_0$ - velocity in the calculated section of BP, m/s;

$_{\infty}$ - ambient temperature;

g - acceleration of free fall; m/s^2 .

$_0$ - excess air temperature at the outflow of the supply jet from the HP, ºC, is determined by the formula

$$\Delta t_0 = |t_0 - t_{o.з.}|,$$

where t_0 is the supply air temperature, ºC.

$_{o.з.}t$ - air temperature in the serviced area of the room, ºC.

The maximum velocity is determined and excess temperature $t = |t - t_{o.з.}|$ at the point where the jet enters the service area:

- for compact, fan, conical jets and flat jets at x≥6 $_0$

$$= \frac{\cdot\ 0\sqrt{\ 0}}{\text{cfn}} = \frac{0}{\sqrt{\ 0}\ \text{cfn}} \quad \text{(Ж.7)}$$

$$t = \frac{n\cdot \Delta t 0\sqrt{\ 0}\ _{\text{в}}}{\text{s-n}} \quad \text{(Ж.8)}$$

- for flat jets at x<6 $_0$

$$= \frac{1\cdot\ 0\sqrt{\ 0}}{\sqrt{\ }\ \text{cfn}}; \quad \text{(G.9)}$$

$$t = \frac{n1\cdot\Delta t0\sqrt{\ 0}\ _{\text{в}}}{\sqrt{\ }\ \text{s- n}}, \quad \text{(Ж.10)}$$

where t_x - maximum (when heated air is supplied) or minimum (when cooled air is supplied) air temperature in the calculated section of the supply jet, ºC;

L_0 - supply air volume flow rate, m^3 /h;

K_c - coefficient of constraint;

$K_в$ - interaction coefficient: in case of a uniform arrangement of HP it is taken equal to $K_в$ = 1, in case of an irregular arrangement - according to Table G.3;

$K_н$ - non-isothermal coefficient.

Correction factors K_c , $K_в$, $K_н$ for the considered scheme are taken equal: K_c = 0,8, $K_в$ = 1, $K_н$ = 1.

The obtained values and t are compared with the normalized , t .

G.5 Air supply from top to bottom in oblique jets

The calculation is made in the following order

The calculated length of the jet is determined x

when supplying isothermal air according to the formula:

$$\xi \quad \frac{yv}{\sin\alpha}, \quad \text{(Ж.11)}$$

where $y_в$ is the vertical distance from the BP installation site to the working area, m,

$$yc = h0 - ho_{.z}.$$

α - angle of slope of BP or elements of BP, degree.

When non-isothermal air is supplied, the horizontal coordinate of the point of

introduction of the jet is determined $x_в$ or graphically by plotting the trajectory of the jet

$$y \; x \; \mathrm{tg}\alpha \qquad \frac{x3}{3H^2 \cos^3 \alpha}. \qquad \text{(Ж.12)}$$

or the solution of the cubic equation (G.14) with respect to *x*.

In formula (G.12) before the second term, the sign "+" corresponds to the supply of warm air, the sign "-" - to the supply of cold air. The angle α > 0º is for upward air supply, the angle α < 0º is for downward air supply.

The value $x = x_в$ is taken as the calculated jet length. The calculated jet length must satisfy the condition:

$$= (, ,) - . \qquad \text{(Ж.13)}$$

The values of maximum speed and excess temperature t in the place of introduction of the jet into the serviced area are determined by formulas (G.14) - (G15).

$$= \frac{- 0\sqrt{0 - -}}{\overline{\quad}} \qquad \text{(Ж.14)}$$

$$t = - \frac{t_0 \sqrt{0}}{\overline{\quad}} \frac{\overline{\quad}}{c - t_н}, \qquad \text{(Ж15)}$$

where $_н$ is the non-isothermal coefficient for velocity correction;

$^{t}{}_{н}$ - non-isothermal coefficient for temperature correction. Non-isothermal coefficient for velocity correction $_н$

is determined by the formula:

$$Kv \cos\alpha \qquad \sqrt{\cos 2^{\alpha} \sin\alpha \qquad \frac{x_в}{H \cos\alpha}} \qquad . \qquad \text{(Ж.16)}$$

In formula (L.16) before the sine sign "+" corresponds to upward air supply, sign "-" - to downward air supply; before the last summand sign "+" corresponds to warm air supply, sign "-" - to cold air supply.

The value ^{t} for the temperature correction is determined by the formula:

$$^{t}{}_{н} = . \qquad \text{(Ж.17)}$$

The interaction coefficient is taken $K_в = 1$. The coefficient of constraint K_c is determined by the table.

Table G.1 - Value of the constriction coefficient K_c when air is supplied from top to bottom in oblique jets

$\frac{F0}{b\,h}$	$\frac{x}{\mu\sqrt{b\,h}}$					
	0,1	0,2	0,3	0,4	0,5	0,6
<0,003	1	1	1	1	1	1
0,003	1	1	0,9	0,85	0,8	0,75
0,005	1	0,9	0,80	0,75	0,7	0,65
0,010	1	0,9	0,7	0,6	0,5	0,4
0,050	1	0,8	0,5	0,4	0,3	0,3

The obtained values and t are compared with the normalized , t .

G.6 Air supply with horizontal cramped jets above the working area when the return flow is formed

The calculation is made in the following order

Determination of the installation height of the HP h_0 , which provides the formation of the return flow. h_0 must meet the conditions:

$$h_0 > h_{o.3.};\qquad (G.18)$$

$$h_0 \geq 0.5h.\qquad (Ж.19)$$

2. The minimum length of the module is defined:

$$a\,0,5\,m\sqrt{Fn}\,,\qquad (Ж.20)$$

where is the transverse area of the room, m, = $b \cdot h$,

b- the width of the room module, served by one HP, m.

3. The maximum speed in the return flow is determined by the graph (Figure G.2) for compact and incomplete fan jets.

For flat jets:

$$= , -_0 - \sqrt{\_0}\qquad .\qquad (Ж.21)$$

circa

4. The obtained value of the maximum velocity in the reverse is compared with the normalized value .

When non-isothermal air is supplied, the calculation is made for the scheme of air supply by inclined jets under the condition α=0.

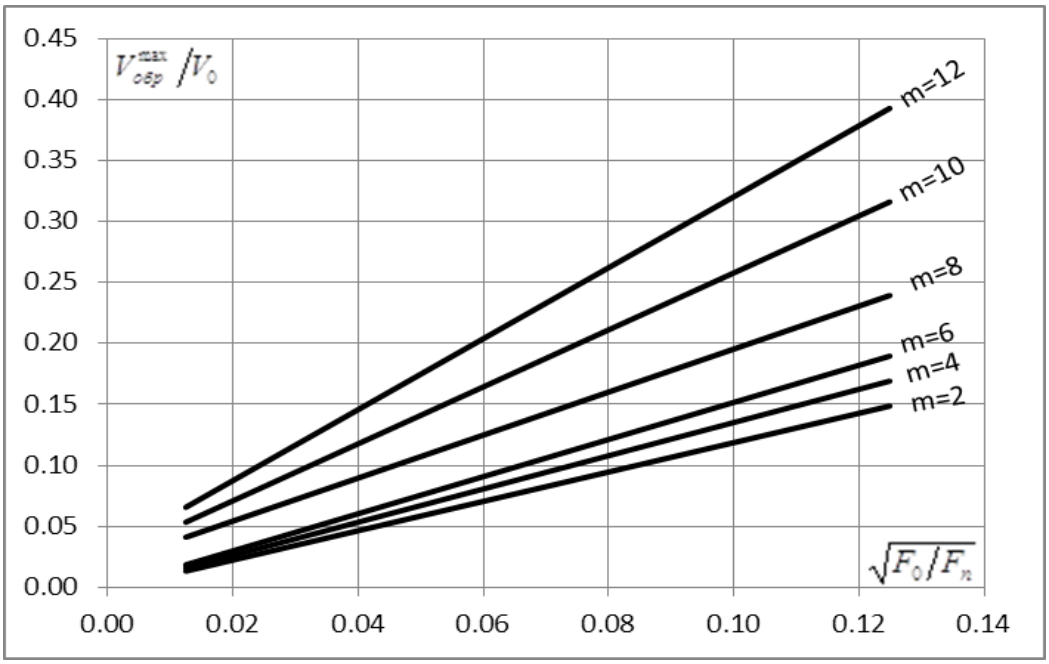

Figure F.2 **- Dependence of the maximum speed in the reverse flow on the parameter √$_0$ constriction and kinematic coefficient m VR**

G.7 Air supply from top to bottom in compact, conical and incomplete fan jets

The calculation is made in the following order

The calculated length of the jet is determined *x*

$$X = h - h_{o.з.} \text{ or } x = h_0 - h_{o.з.}. \quad (Ж.22)$$

When heated air is supplied, the condition of preserving the appearance of the jet is checked by calculating the distance to the braking point $x_в$ (top of the jet)

– *for compact and conical jets*

$$_в = , ; \quad (Ж.23)$$

– *for incomplete fan jets*

$$_в = , \quad (Ж.24)$$

– *for flat jets*

$$_в = , . \quad (Ж.25)$$

The calculated length of the jet *x* must not exceed the distance to the top jets

$$_в \quad . \quad (Ж.26)$$

2. The maximum velocity values are determined и excess temperature *t* at the place of introduction of the jet into the serviced area according to the formulas (Ж.7÷10).

The value of the coefficient K_H is calculated by the following formulas

- for compact and conical jets

$$_{н} = \quad - ( ) \frac{}{H} \qquad (Ж.27)$$

- for incomplete fan jets

$$_{н} = \quad , - ( ) \frac{}{H} \qquad (Ж.28)$$

-for flat jets

$$_{н} = \sqrt{- (\quad)^{3}}. \qquad (Ж.29)$$

In formulae (G.27÷29) the "+" sign corresponds to the supply of The sign "+" corresponds to the supply of cool air, the sign "-" to the supply of warm air.

The interaction coefficient is taken $K_в = 1$. The coefficient of constraint K_c is taken according to Table G.1.

The obtained values$_x$ and t_x are compared with the normalized , t .

G.8 Air supply from top to bottom in fan jets

The calculation is made in the following order

The calculated jet length *x* is determined by the formula

$$= , - \sqrt{h_{о.з.0} - h_{о.з.}}. \qquad (Ж.30)$$

When chilled air is supplied to the room, the condition of maintaining the calculated scheme of the jet is checked by the formula (G.4).

The values of maximum velocity$_x$ and excess temperature t_x in the place of introduction of the jet into the serviced area are determined by the formulas (Zh.9÷12).

Correction factors are taken as $K_в = 1$, $K_н = 1$, the constraint factor K_c - according to Table Zh2.

Table G.2 - Value of restriction coefficient K_c for air supply from top to bottom by fan jets

$\frac{h\,ho_{z}a}{\sqrt{b}}$	0,1	0,4	0,8	1,2	1,5	2,0
K_c	0,9	0,8	0,7	0,65	0,6	0,6

The obtained values$_x$ and t_x are compared with the normalized values , t .

G.9 Supply air to the work area with low velocity flows (displacement ventilation)

The calculation is made in the following order

The distance from the BP to the nearest workplace is taken as the design jet.

The values of maximum velocity$_x$ and excess temperature t_x in the place of introduction of the jet into the serviced area are determined by the formulas (Zh.9÷12).

Correction factors are taken as: K_c =1, $K_в$ =1, $K_н$ =1.

Table F .3 - Interaction coefficient $K_в$ in case of uneven arrangement of HP in the room

Number jets	The *K* value$_в$ when *x/l* is equal to							
	10	20	30	40	50	60	80	100
2	1	1,15	1,3	1,35	1,35	1,4	1,4	1,4
3	1	1,2	1,4	1,55	1,6	1,7	1,7	1,7
4	1	1,2	1,5	1,65	1,8	1,8	,9	2,0
5	1	1,2	1,5	1,7	1,9	2,0	2,1	2,1
6	1	1,2	1,5	1,7	1,9	2,0	2,2	2,3
7	1	1,2	1,5	1,7	1,9	2,1	2,3	2,4
8	1	1,2	1,5	1,7	1,9	2,1	2,3	2,5
9	1	1,2	1,5	1,7	1,9	2,1	2,35	2,6
10	1	1,2	1,5	1,7	1,9	2,1	2,4	2,6
11	1	1,2	1,5	1,7	1,9	2,1	2,4	2,6
12 и over	1	1,2	1,5	1,7	1,9	2,1	2,4	2,7

N o t e - *l* is the distance between the air diffusers.

Appendix I

Permissible velocity of the coolant in the pipelines

Table 1.1

Permissible equivalent noise level, dBA	Permissible water velocity, m/s, in pipelines at the sum of coefficients of local resistance of the heater node or pipe node with fittings, reduced to the velocity of the coolant in the pipes				
	up to 5	up to 10	up to 15	up to 20	up to 30
25	1,5/1,5	1,1/0,7	0,9/0,55	0,75/0,5	0,6/0,4
30	1,5/1,5	1,5/1,2	1,2/1,0	1,0/0,8	0,85/0,65
35	1,5/1,5	1,5/1,5	1,5/1,1	1,2/0,95	1,0/0,8
40	1,5/1,5	1,5/1,5	1,5/1,5	1,5/1,5	1,3/1,2

P a g e

1 The numerator is the allowable velocity of the coolant when ball valves are used, the denominator is the allowable velocity when valves and control valves are used.

2 The rate of flow of water in pipes laid through several rooms should be determined by taking into account:

- room with the lowest permissible equivalent noise level;
- fittings with the highest coefficient of local resistance, installed in any section of the pipeline running through the room, with a length of 30 m on both sides of the room.

Appendix K

Metal ducts (permissible cross-sections and metal thickness)

R.1 The aspect ratio for rectangular ducts must not exceed 1 to 4.

K.2 Thickness of sheet steel for ducts carrying air with a temperature not exceeding 80 °C should be taken at least:

for circular ducts - diameter, mm:

	up to 200 inclusive.	0,5
- from 250	up to 450 inclusive.	0,6
- from 500	up to and including 800.	0,7
- from 900	up to and including 1,250.	1,0
- from 1400	up to and including 1600.	1,2
- from 1800	up to 2,000 inclusive.	1,4

for ducts with rectangular cross-section - the size of the larger side, mm:

	up to250 inclusive.	0,5
- from 300	up to 1,000 inclusive.	0,7
- from 1250	up to 2,000 inclusive.	0,9

These values apply to the folded ducts and do not apply to the ducts for technological systems (aspiration, pneumatic transport, etc.).

For welded ducts, the thickness of steel is determined by the conditions of welded work. For black steel - from 1,5 mm to 2,0 mm.

K.3 For ducts carrying air with temperatures above 80 °C or air with mechanical impurities or abrasive dust, steel thickness and material should be selected for resistance and durability.

K.4 For ducts with standardized fire resistance limits, the thickness of steel should be taken in accordance with fire safety standards, ensuring compliance with the requirements of the Law of the Kyrgyz Republic "On Fire Safety".

Appendix L

Recommended air velocity in the air ducts of ventilation and air conditioning systems

Table L.1 - Recommended average air velocities in the ducts of exhaust ventilation systems for public buildings

Type of system	Speed, m/s
Exhaust systems with a capacity of up to 500 m^3 /h with the number of hours of operation per year:	
Up to 2000 included.	3,0-4,0
2,000 to 4,000 inclusive.	2,5-3,5
4,000 to 6,000 inclusive.	2,0-3,0
St. 6,000.	1,5-2,5
Exhaust systems with a capacity of 500 to 2,000 m3/h at the number of operating hours per year:	
Up to 2000 included.	4,0-5,0
2,000 to 4,000 inclusive.	3,5-4,5
4,000 to 6,000 inclusive.	3,0-4,0
St. 6,000.	2,5-3,5
Exhaust systems with a capacity of 2,000 to 5,000 m3/h at the number of operating hours per year:	
Up to 2000 included.	4,5-5,5
2,000 to 4,000 inclusive.	4,0-5,0
4,000 to 6,000 inclusive.	3,5-4,5
St. 6,000.	3,0-4,0
Exhaust systems with a capacity of more than 5000 m3/h at the number of operating hours per year:	
Up to 2000 included.	5,0-6,0
2,000 to 4,000 inclusive.	4,5-5,5
4,000 to 6,000 inclusive.	4,0-5,0
St. 6,000.	3,5-4,5

Table L .2 - Recommended average air velocities in the ducts of fresh air ventilation systems for public buildings

Type of system	Speed, m/s
Supply ventilation systems with a capacity of up to 3 000 m^3 / h with the number of operating hours per year:	
Up to 2000 included.	4,0-5,0
2,000 to 4,000 inclusive.	3,5-4,5
4,000 to 6,000 inclusive.	3,0-4,0
St. 6,000.	2,5-3,5
Supply ventilation systems with a capacity of 3,000 to 10,000 m3/h at the number of operating hours per year:	
Up to 2000 included.	5,0-6,0
2,000 to 4,000 inclusive.	4,5-5,5
4,000 to 6,000 inclusive.	4,0-5,0
St. 6,000.	3,5-4,5
Supply ventilation systems with a capacity of more than 10,000 m3 /h at the number of hours of operation per year:	
Up to 2000 included.	5,5-6,5
2,000 to 4,000 inclusive.	5,0-6,0
4,000 to 6,000 inclusive.	4,5-5,5
St. 6,000.	4,0-5,0
Supply air systems with integrated exhaust air heat recovery for the number of operating hours per year:	
Up to 2000 included.	5,0-6,0
2,000 to 4,000 inclusive.	4,5-5,5
4,000 to 6,000 inclusive.	4,0-5,0
St. 6,000.	3,5-4,5

Table L.3 - Recommended average air velocities in the ducts of supply and exhaust ventilation systems for residential buildings

Type of system	Speed, m/s
In satellites of natural ventilation systems	1,0-1,5
In the collection duct of natural ventilation systems	2,0-2,5
In the exhaust shaft of natural ventilation systems	Up to 1.0
Systems with mechanical inducement within the serviced premises	1,5-2,5
Systems with mechanical inducement outside the serviced premises	2,0-4,0

Table L.4 - Recommended average air velocities in the ducts of supply and exhaust ventilation systems for industrial buildings

Type of system	Speed, m/s
Supply systems for mechanical ventilation	4,0-7,0
Air supply systems with natural induction	0,5-1,0
Exhaust with natural induction	0,5-1,0
Mechanical exhaust ventilation systems	4,0-8,0
N o t e (to Tables L1-L4) - At higher air speeds and if there are requirements to limit the noise impact, it is recommended to perform an acoustic calculation.	

Appendix M

Air-tightness classes of air ducts

Table M.1

Leaktightness class	Static limit value pressure , Pa		Limit value of air leakage *f* max, m^3/h, per m^2
	Positive	Negative	
A	500	500	$0.097 \cdot p^{0,65}$
B	1000	750	$0,032 \cdot p^{0,65}$
C	2000	750	$0,0108 \cdot p^{0,65}$
D1)	2000	750	$0,0036 \cdot p^{0,65}$

1) Special purpose air duct system.

P a g e

1 The leakage coefficient *f* must be less than the air leakage limit value *f* max, according to the required tightness class specified in this table for any test pressure $_{tt}$, less than or equal to the design working pressure $_{din}$. The requirements must be met for positive and negative pressures.

2 The duct system must be able to withstand *the* static pressure limits specified in this table without permanent deformation or without any sudden change in leakage rate or test air pressure. Deformation indicate only if the cross-sectional area is reduced by at least 10%.

The criterion for selecting the tightness class is the allowable percentage of air leakage in the system under operating conditions (air infiltration into the equipment operating at reduced pressure, or in the absence of air exfiltration from the equipment operating at increased pressure).

Air leaks in air conditioners, elements of ventilation systems, etc. must not exceed the leakage values of leakage class A.

Leaktightness class A may also apply to open ducts passing through the rooms they serve, and in cases where the pressure drop in relation to the internal air does not exceed 150 Pa.

Leaktightness class B is used for ducts running outside the ventilated space, or for ducts in the ventilated space, where the pressure drop in relation to the internal air

exceed 150 Pa. All overpressure exhaust ducts, in relation to the room air, except ventilation chambers, must have an airtightness class not lower than class B.

Leakage class C is used if the difference between the air pressure in the duct and the room air pressure is more than 1500 Pa or if the leakage may result in non-compliance with the indoor air quality requirements, the specified pressure maintenance conditions or the ventilation system operation.

Leaktightness class D is used in special cases according to the technical specification.

Appendix H

Fire resistance limits of transit air ducts

Table H.1

Rooms served by the ventilation system	Fire resistance limit EI, min, when laying transit ducts and collectors through the premises								
	Storerooms and storage rooms categories A, B, B1-B4 and	production categories			Technical floor, corridor of the production building	Public and administrative	Domestic (toilets, showers, washrooms, bathhouses,	Technical floor, corridor (except for industrial building)	Residential
		A, B or C1-B4	Г	Д					
Warehouses and storerooms categories A, B, B1-B4, vestibule airlocks in the premises of categories A and B, as well as local suction explosion-hazardous mixtures	30/30	30/30	30/30	30/30	30/30	ND	ND	30	ND
Production categories A, B or C1-B4	30/30	15/30	15/30	15/30	15/30	152)/30	15/30	15/30	ND
Production-D categories	30/30	15/30	НН	НН	15/301)	30/30	15/30	15/30	ND
Production-D categories	30/30	15/30	НН	НН	НН/301)	15/301)	НН/30	НН/30	ND
Corridor industrial building	30/30	15/30	НН/301)	НН/301)	НН/301)	НН/301)	НН/301)	НН/301)	ND
Public and administrative residential buildings	ND	152)/30	30/30	НН/301)	НН/301)	НН/301)	НН/301)	НН/301)	ND
The households (toilets, showers, washrooms, baths, etc.)	30/30	15/30	15/30	НН/301)	НН/301)	НН/301)	НН/301)	НН/30	ND
Corridor (excluding production buildings)	ND	ND	ND	НН/301)	НН/301)	НН/301)	НН/301)	НН/30	НН/30

Residential	ND	ND	ND	HH 301)	HH 301)	HH 301)	HH 301)	HH 30	HH 30

End of Table H.1

Rooms served by the ventilation system	Fire resistance limit EI, min, when laying transit ducts and collectors through the premises								
	Storerooms and storage rooms categories A, B, B1-B4 and combustible materials	production categories			Technical floor, corridor of the production building	Public and administrative	Domestic (toilets, showers, washrooms, baths, etc.)	Technical floor, corridor (except for the production buildings)	Residential
		A, B or C1-B4	Г	Д					
[1)] EI 15 - in buildings of III or IV degree of fire resistance. [2)] It is not allowed to install ducts from the premises of categories A and B. Designations: "ND" - it is not allowed to lay transit ducts. "HH" - the fire resistance limit of transit air ducts is not rated. Values of the fire resistance limit are given in this table as a fraction: - in the numerator - on the floor to be served - in the denominator - outside the floor to be served. Air ducts routed through the different rooms of the floor must be made with the same high fire resistance rating.									