Production Association Belorusneft
Belarusian Gas Processing Plant

MATERIAL SAFETY DATA SHEET

Normal butane fraction

Gomel, 2015

Material Safety Data Sheet

Safety Data Sheet MSDS BGPP:	**400051902**	**011**	**2015**	APPROVED Director General RUE Production Association Belorusneft */signed/* A.A. Lyakhov 01.10.2015 L.S.
Valid until: 01.10.2020				
				/SEAL/ "Republic of Belarus * Republican Unitary Enterprise * Production association * BELORUSNEFT"

NAMES:

technical (as per TNLA)	Normal butane fraction
chemical (as per IUPAC)	Hydrocarbons C3-C5
trade name	Normal butane fraction of Grades Premium, A, B, C
synonyms	Mixture of hydrocarbons C3-C5; liquefied mixture of hydrocarbon gases; mixture of saturated and unsaturated hydrocarbons, gas of C3-C5 fractions

IDENTIFICATION AND NAME OF NORMATIVE DOCUMENTS (STB, GOST, TU, etc.)

TU BY 400051902.017-2015 Normal butane fraction. Specification.

OKP RB Code:	FEACN Code:	Register of Hazardous Chemical and Biological Substances No. and date:
241411200	**2901100001**	
232021700	**2711139100**	
	2711139700	

HAZARD CHARACTERISTICS:

Signal word: Danger

Brief description (in words): flammable liquefied gas, heavier than air, ignited by sparks and flames, forms explosive mixtures with air, may accumulate in low unventilated areas, insoluble in water

Detailed description: see 16 sections of this MSDS

MAIN HAZARDOUS COMPONENTS:

Component description	CAS No.	EC No.	MPC $_{d.a./o.t.}$, mg/m^3:	Hazard Class:
Normal butane	106-97-8	203-448-7	300/900	4
Propane	74-98-6	200-827-9	300/900	4
Isobutane	75-28-5	200-857-2	300/900	4
Isopentane	78-78-4	201-142-8	300/900	4
Normal pentane	109-66-0	203-692-4	300/900	4

Applicant (approving organization): RUE Production Association Belorusneft.
(full name of organization)

9, Rogachevskaya St., Gomel 246003.
(organization address)

Type of applicant: producer, supplier, distributor, ~~exporter, importer~~
(strike out whichever does not apply)

Emergency phones: (+375232) 71-25-45 (24-hour); (+3752340) 2-22-78

Developer enterprise: BelNIPIneft of RUE Production Association Belorusneft, Gomel

TNLA – Technical Normative Legal Acts (STB, GOST, TU, etc.).

IUPAC – Nomenclature of Organic Compounds of International Union of Pure and Applied Chemistry.

OKP RB – State Classification of Products of the Republic of Belarus.

FEACN – Foreign Economic Activity Commodity Nomenclature.

RHCBS – Register of Hazardous Chemical and Biological Substances

MPC $_{d.a./o.t.}$ – Maximum Permissible Concentration (daily average/one-time) in the air of work area.

CAS No. – substance number in the index of Chemical Abstracts Service

EC No. – substance number in the index of European Chemicals Agency

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product name:	Normal butane fraction
Components:	Propane, butane, isobutane, pentane (isomers mixture) [1]
Source materials used:	Wide fraction of light hydrocarbons
Product Use:	Intended for further processing in petrochemical industry or for use as a fuel component [1]
Manufacturer/Supplier full name:	Republican Unitary Enterprise Production Association Belorusnef, Belarusian Gas Processing Plant
Mailing address:	9, Rogachevskaya Street, Gomel, 246003, Republic of Belarus
Director General:	Alexander Andreevich Lyakhov (+375232) 71-25-23
Chief Engineer:	Vladimir Davidovich Goshkis (+375232) 79-35-60
Emergency telephone numbers:	(+375232) 71-25-45 (+3752340) 2-22-78
Fax number:	(+375232) 79-34-35

2. HAZARDS IDENTIFICATION

General hazard statement:	Normal butane fraction is flammable, fire and explosion hazardous liquefied gas; it is a low-toxic (low-hazard) product having specific characteristic odor and by level of effects on the human body is referred to Hazard Class 4 [1], [2]. Liquefied gases vapors may accumulate in low unventilated areas [1], [14].
Allowable workplace exposure limits:	MPC $_{d.a./o.t.}$: 300/900 mg/m^3 [32]
Marking elements:	 Danger. Extremely flammable gas. [7]
Safety measures:	Keep away from sources of ignition, heat, sparks, open fire. No smoking [7].

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name (acc. to IUPAC): Hydrocarbons C4 – C6

Chemical formula: Mixture of hydrocarbons, with normal pentane (C_5H_{12}) being major component

General composition characteristics:
(with regard to grades range and statement of impurities and functional additives influencing hazardous characteristics of the product)

Parameter description	Standard as per grade			
	Premium	A	B	C
1 Mass fraction of components, %:				
propane, max.	0.3	0.5	1.0	1.0
isobutane, max.	0.9	1.5	4.0	not reg.
sum of butylenes, max.	0.5	1.0	1.0	2.0
normal butane, min.	98.6	97.5	94.0	88.0
Sum of iso- and normal pentane, max.	0.4	0.6	2.5	5.0
2 Mass fraction of hydrogen sulfide and sour sulfur, %, max.	0.005	0.005	0.01	0.01
3 Free water and alkali content	None	None	None	None

Components:

Component Description	Number		MPC $_{d.a./o.t.}$, mg/m^3:	Hazard Class:
	CAS	EN		
normal butane	106-97-8	203-448-7	300/900	4
propane	74-98-6	200-827-9	300/900	4
isobutane	75-28-5	200-857-2	300/900	4
isopentane	78-78-4	201-142-8	300/900	4
normal pentane	109-66-0	203-692-4	300/900	4
hydrogen sulfide	7783-06-09	231-977-3	10	2

Hazard identification:
EC Classification (Directive 67/548/EEC): F+; R12

Hazard characteristics: Slight exceeding of maximum allowable concentrations of liquefied gas vapors in the air causes oxygen debt in humans; significantly exceeded concentrations may cause lethal suffocation.
When contacting the human body, liquefied gases cause cryogenic burns [1], [2].

4. FIRST AID MEASURES

Routes of exposure:	High concentrations of liquefied gas vapors in the air are dangerous when inhaled or contacting with skin and eyes [1], [3].
Signs and symptoms observed:	A person staying in the environment where small amount of normal butane fraction vapors is present will experience oxygen debt, while significant concentrations may cause lethal suffocation [1]. Prolonged inhalation of normal butane fraction vapors in concentrations slightly exceeding the MPC results in dizziness, nausea, headache and weakness; concentrations significantly exceeding the MPC may cause suffocation. Chronic intoxication results in central nervous system disorder [1]. Strong cooling effect may cause severe frostbites. Contact of liquefied gas drops with eyes may cause loss of vision [1], [22]. Clinical signs of acute intoxication: excitation, dizziness, headache, sleepiness, altered breathing [11], [22].
First aid measures:	Call an ambulance. Fresh air, recovery position, warming, fresh clothes. Flush skin and eyes with water [22].
- intoxication after inhaling:	Remove victim from contaminated area, put in dorsal position, remove clothing which hampers breathing. Provide fresh air. Keep warm. Use cotton soaked with liquid ammonia to bring to consciousness. Give hot drinks. If breathing has altered, apply artificial respiration. Seek medical assistance immediately. [1], [10], [15], [22].
- contact of liquid phase of liquefied hydrocarbons with clothing:	In case of contact with clothing, change into fresh clothing. Remove contaminated clothing immediately to prevent the human body from contact with liquid phase.
- skin contact with liquid phase:	After skin contact, immediately rinse the affected area with plenty of water. Apply burntreating ointment to the affected area.
- frostbite:	Apply dry sterile bandage to the affected skin areas, remove the victim to warm place. Give warm drinks. Take the victim to healthcare centre [10].
- eye contact:	Rinse immediately with running water, while keeping eye fissure wide open. Seek medical assistance immediately [10].

First aid supplies: First aid kit shall include: ammonia (liquid ammonia) – 25 ml, bandages – 5 pcs., Vaseline – 1 tube, absorbent cotton – 150 g, Epsom salt – 300 g, iodine tincture – 20 ml, activated carbon – 100 mg, potassium permanganate – 20 g, hydrogen peroxide (3% solution) – 100 g, sodium bicarbonate – 200 g, boric acid – 20 g [10].

5. FIRE-FIGHTING MEASURES

General description: Highly flammable, fire-hazardous and explosive gas [1], [3], [4], [14]. Easily ignited by spark and flame. Vapors accumulate in low areas and at explosive-hazardous concentrations form explosive mixtures with air. Cylinders (containers) may explode if heated. Residues may form explosive mixtures in empty vessels. [4], [5].

Fire and explosion characteristics:

Parameter description	Propane	Butane	Isobutane	Pentane (isomers mixture)
Flash point, °C:	minus 96 (est.)	minus 69 (est.)	minus 76 (est.)	minus 44
Autoignition temperature, °C	470	372	460	258
Flame propagation limit in the air, % (vol.):				
upper	1.7	1.4	1.3	1.4
lower	10.9	9.3	9.8	7.8
Mixture explosiveness group	T1	T2	T1	T3
Mixture explosiveness category	IIA	IIA	IIA	IIA

Suitable extinguishing media: In case of ignition the following extinguishing media should be used:
- extinguishing powder, carbon dioxide (CO_2) – in enclosed spaces;
- for smothering in case of fire apply phlegmatizing gas agents [1].

Unsuitable extinguishing media: Do not extinguish fire unless flow of gas can be stopped immediately [4].

Special protective equipment for fire fighters: Fire-fighting suit with SPI-20 self-rescuer. Fire-entry suit [13], [23].

Specific extinguishing methods: No data [4].

6. ACCIDENTAL RELEASE MEASURES

General measures:	Use fireproof, explosion-proof, leak-proof and antistatic equipment. Ensure compliance with operating procedures. Use spark-proof tools. Working areas must be equipped with supply-and-exhaust blast-proof ventilation. Ensure monitoring of hydrocarbons content in the working area using portable or automatic devices. Analysis of industrial effluents for petroleum products content [1], [3], [15].
Personal protection in case of fire or leakage:	At low concentrations of liquefied hydrocarbon gas vapors (up to 0.5 per cent by volume), use RPG-67 Gas Filtering Respirator with A cartridge. At high concentrations, use self-contained hose gas masks with blowers or use breathing apparatuses [1], [22]. Use respirators, safety goggles with side shields, gloves [10].
Operating procedure in case of leak/spillage:	Stop work in hazardous area. Small leak/spillage: eliminate observing safety precautions. Large leak/spillage: set fire to leaking gas in consultation with the experts of Ministry of Emergency Situations and let it burn itself out under the control of water jets. Isolate the affected area until gas dissipates. Do not touch spilled material. Dike spillage area and prevent the material from entering water reservoirs. Use personal protective equipment [16], [17].
Environmental precautions:	Ensure maximum sealing of containers, utility lines, pumps and other equipment, adhere strictly to operating procedures. Ensure periodic monitoring of hydrocarbon vapors content in the working area, analysis of industrial effluents for petroleum products content [1], [3]. Ensure leak-proof loading and unloading, provide stationary hosing devices, automation systems for loading and unloading operations [1], [3]. All places where entry of normal butane fraction into water reservoirs is possible must be provided with catching facilities and devices for containment and collection of spilled material.
Firefighting procedure:	Do not approach containers. Cool containers with water at a maximum possible distance. Do not extinguish unless leak can be stopped safely. Use fine sprayed foam to extinguish at a maximum possible distance [4], [9].
Containment and clean up:	Use water fog spay to disperse (isolate) liquefied gas vapors. Drench spillage area with air-filled foam or inert material [6], [9].

7. STORAGE AND HANDLING

Protective measures and equipment:	Equip industrial premises with supply-and-exhaust ventilation system. Do not use open fire inside any premises relating to production, storage and pumping of normal butane fraction; artificial lighting must be blast-proof. Use personal protective equipment, exercise proper personal hygiene. Conduct regular monitoring of hydrocarbons content in the air of working area [1], [3].
Environmental exposure controls:	Ensure maximum sealing of containers, utility lines, pumping units and other equipment, adhere strictly to operating procedures. In production facilities and open spaces, ensure periodic monitoring of hydrocarbon content in the air of working area, using portable or automatic devices (analyzers, detectors) allowed for use according to the established procedure. Perform analysis of industrial effluents for petroleum products content in accordance with the Guidelines for Analysis of Industrial Effluents of Petroleum-Processing, Gas-Processing and Petrochemical Plants, approved in accordance with the established procedure [1].
Precautions for safe transportation:	By rail and road transport in accordance with Dangerous Goods Regulations in force for the relevant kind of transport, as well as the regulations on construction and safe operation of pressure vessels [1], [3], [9], [19].
Storage and handling conditions:	Store in horizontal and spherical high-pressure sealed metal vessels, both fixed and portable. Vessels must not contain bottom water above the minimum level ensured by design of water drainage device [1], [4], [22]. Liquefied gases must be dispensed into tanks, steel cylinders and other containers certified in accordance with Regulations on construction and safe operation of pressure vessels [1], [33]. Overpressure in tanks after drainage of liquefied gases must be not less than 0.05 MPa (380 mm Hg) [4]. Store cylinders (containers) away from open flames [23]. Liquefied gas in containers must be stored on racks, pallets or stacks, in covered storage areas, under a canopy or on graded sites protected from direct sunlight and precipitation [1], [4].
Warranty period:	6 months from the date of shipment [1].

Incompatible materials:	Do not store in the same premises with materials capable of forming explosive mixtures (potassium nitrate, calcium nitrate, sodium nitrate, barium nitrate, potassium perchlorate, potassium chlorate etc.); combustion-supporting gases: oxygen and air in compressed or liquid state; substances liable to spontaneous combustion or capable of self-igniting by water and air (potassium, sodium, calcium, calcium carbide, calcium phosphide, sodium peroxide, barium peroxide, aluminum dust/powder, aluminum triethyl, diethyl aluminum chloride etc.); highly flammable and combustible liquids (gasoline, benzene, carbon disulphide, acetone, turpentine, toluene, xylene, kerosene, organic oils); highly flammable and combustible solids (celluloid, red phosphorus, naphthalene, safety matches); substances capable of causing ignition (bromine, nitric and sulfuric acids, chromic anhydride, potassium permanganate); inflammable substances (cotton, hay, cotton wool, hemp, sulfur, peat, charcoal - other than fresh-burned, soot of plant and animal origin etc.) [9].
Materials used for tanks, vessels and containers:	Metal (steel) [6], [9]. Newly made metal containers must have oil-resistant and vapor-resistant protective internal coating complying with electrostatic sparking safety requirements [6], [9].
Additional information:	Cargo containers must be sealed. Artificial lighting and all electric equipment used must be blast-proof. Containers, utility lines, truck tanks and pumping units must be grounded [1], [3].

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Parameters subject to mandatory monitoring ($MPC_{d.a./o.t.}$):	300/900 mg/m^3 [1], [32].
Measures to ensure and control the specified parameters:	Maximum sealing of containers, utility lines and other equipment, strict adherence to operating procedures. Supply-and-exhaust ventilation of industrial facilities. Use portable and fixed automatic devices (analyzers, indicators) to monitor the air in working areas [1].
Personal protective equipment:	Working clothes and footwear according to industry standards for free provision of personal protective equipment [13].

Respiratory and eye protection:	At low concentrations slightly above the liquefied gases MPC (up to 0.5 per cent by volume), use small-size filtering gas masks (PFMG) with DOT-460AH filters, and filtering gas masks SR-200 with SR-298AX filters. At high concentrations and during work in closed containers, vessels, wells etc., use self-contained hose gas masks PSH-1, PSH-2, as well as breathing apparatuses ASV-2, AP-96 and AIR-5500 [1]. Use respirator, safety goggles, hard hat and gloves [6], [9], [10].
Hand protection:	Gloves: combined, canvas cloth and rubberized, oil-and-frost resistant [14].

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Gas [1], [2], [12].

Color: Colorless [2], [12].

Odor: Specific characteristic [2].

Solubility: Insoluble in water

Physical & chemical characteristics of components being parts of normal pentane fraction [4], [12], [22]:

Parameter description	Propane	Butane	Isobutane	Pentane (isomers mixture)
Flash point, °C	minus 96 (est.)	minus 60 (est.)	minus 76 (est.)	minus 44
Autoignition emperature, °C	470	372	460	258
Flame propagation limit in the air, % (vol.): lower upper	 1.7 10.9	 1.4 9.3	 1.3 9.8	 1.4 7.8
Molecular weight	44.096	58.123	58.12	72.15
Density, kg/m^3	579 (at -40°C)	578.9 (at 20°C)	2.672 (at 0°C)	621.4
Specific gravity, kg/m^3	1.56	2.0665	-	-
Vapor viscosity, Pa·s	$2 \cdot 10^5$ (at -40°C)	$73.9 \cdot 10^5$ (at 20°C) $2.5 \cdot 10^5$ (at -20°C)	$73.9 \cdot 10^5$ (at 20°C)	$6.24 \cdot 10^5$ (at 0°C)
Melting point, °C	-187.6	-138.35	-	-
Boiling point, °C	-42.06	-0.5	-11.72	36
Formation heat, kJ/mol	-103.8	-126	-134.5	-146.4
Combustion value, kJ/mol	-2044	-2657	-2649	-3272
Compressibility factor	0.281	0.274	-	-

- – no reference data available

10. STABILITY AND REACTIVITY

Chemical stability:	Chemically stable [12].
Reactivity:	May be oxidized, halogenated, sulfonated and nitrated. Under normal conditions – chemically inert to water, acids and other substances [12].
Conditions to avoid:	Exposure to open fire [1]. Heating during storage and transportation [10], [22]. Dropping and hitting of cylinders [10], [22]. Accumulation in low and unventilated areas [1], [22].
Incompatible substances (materials):	Substances capable of forming explosive mixtures; combustion-supporting gases: oxygen and air in compressed or liquid state; substances liable to spontaneous combustion or capable of self-igniting by water and air; highly flammable and combustible liquids; highly flammable and combustible solids; substances capable of causing ignition; inflammable substances [10].
Useful life:	6 months from date of shipment [1].

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11. TOXICOLOGICAL INFORMATION

General characteristics:	Toxicity of products resulting from incomplete combustion of gases [1]. Normal butane fraction is a low-hazard product and by level of effects on the human body is referred to Hazard Class 4 [1]. Toxicity under normal conditions is basically determined by oxygen debt. High concentrations in the air, due to lack of oxygen, may cause rapid death by asphyxiation. Vapors inhalation causes narcotic effect and irritation of respiratory tract and eyes. Liquid phase may cause cold burns when contacting with unprotected skin and eyes [1].
Routes of exposure:	Inhalation, skin and eye contact.
Affected organs, tissues and systems of the human body:	Nervous and cardiovascular systems; lungs, eyes, skin.

Information on toxic effects during direct contact with the substance, as well as consequences thereof:	
- inhalation:	Vapors inhalation is associated with anoxia and causes narcotic effect. High concentrations may cause serious injuries to nervous system and impair cardiac activity.
- eye contact:	Lacrimation, photophobia.
- skin contact:	Liquefied gas may cause cold burns when contacting with skin.
Data concerning long-term adverse effects on the human body:	
Percutaneous action; carcinogenicity; mutagenicity; embryotropic, gonadotrophic, teratogenic effect:	Not studied [21].
Sensitizing effect:	Not studied [21].
Cumulative effect:	Weak [21].
Acute toxicity:	CL_{50}>50000 mg/m^3, 2±4 hours, inhalation (mouse) [2]. DL_{50}>2500 mg/kg, cutaneous application (animals) [2]. DL_{50}>5000 mg/kg, intragastric application (animals) [2]. Index of potential inhalation toxicity < 3 (at 20°C), mice [2].

12. ECOLOGICAL INFORMATION

Ways of release in the environment:	Failure to comply with requirements of the rules for handling and storage; as a result of emergency situations [21].
Observable environmental impact:	Atmospheric air pollution [21].
Transformation in the environment:	Biodegradable. Dissipates in the atmosphere [10].
Environmental toxicity factors	No data

Hygienic standards in the environment:	Butane: MPC $_{atm.\ air\ d.a./o.t.}$ = 80/200 mg/m^3 [1], [10], [29], [30]. Isobutane: MPC $_{atm.\ air\ d.a./o.t.}$ = 6/15 mg/m^3 [1], [10], [29], [30]. Propane: MPC $_{atm.\ air\ d.a./o.t.}$ = 12/30 mg/m^3 [1], [10], [29], [30]. Pentane: MPC $_{atm.\ air\ d.a./o.t.}$= 25/100 mg/m^3 [1], [10], [29], [30].

13. DISPOSAL CONSIDERATIONS

Waste transportation:	In a specially equipped transport, which prevents loss of waste and contamination of the environment on the route [16].
Measures for safe handling of waste:	Keep away from open flames. [10] Keep away from heat during storage and transportation, prevent cylinders from dropping and hitting [16], [17].
Information on removal, recycling and/or disposal of waste:	Waste material must be sent for neutralization/burying to a specialized enterprise according to the established procedure. If necessary, perform controlled burning on fire locations or centralized burning. Ensure conditions for complete dissipation of residual gas.
Containers treatment (neutralization methods, possibility of reuse):	Contaminated containers must be washed using hot water with petroleum solvent, or steamed and dried [9], [16], [17].

14. TRANSPORT INFORMATION

Proper shipping name:	Normal butane fraction. Normal pentane fraction of Premium, A, B and C Grades [1].
UN No.	1011 [9].
Types of transport:	Road and rail transport [1].
Dangerous goods classification:	Class 2, subclass 2.1, classification code 2F, classification reference 2112 [6], [8], [9].
Hazard labels:	Drawing No. 2.1 [9].

Flammable gases

	Symbol (flame): black or white; Background: red; Figure "2" in bottom corner.
Hazard Identification No.	23 [6], [9].
Package group	None [7].
Emergency card number	206 [22]
Recommendations on transportation:	To be transported in liquid state [1], [6], [19]. In truck-mounted tanks with oil-resistant and vapor-resistant protective internal coating complying with electrostatic sparking safety requirements. In specialized rail tank cars of the consignor (consignee), designed to withstand pressures. Rail tank cars, railcars and truck-mounted tanks with gas must be sealed in accordance with the Regulations on carriage of goods applicable for rail and road transport [6], [9].
General cargo prohibited from carriage together with the material:	Transportation must be carried out in accordance with Dangerous Goods Regulations in force for the relevant kind of transport [6], [9].

15. REGULATORY INFORMATION

Law of the Republic of Belarus "On Environmental Protection" (Rev. No. 225-З dd. 30.12.2014).
Law of the Republic of Belarus "On Waste Management" (Rev. No. 130-З dd. 04.01.2014).
Law of the Republic of Belarus "On Protection of Consumers' Rights (Rev. 106-З No. 04.01.2014).
Law of the Republic of Belarus "On the Sanitary-Epidemiological Welfare of Population".
GOST 30333-2007 Material Safety Data Sheet. General Requirements.
Hazardous Substances Directives: Directive 67/548/EEC; Directive 1999/45/EC

16. OTHER INFORMATION

This is the first edition of Material Safety Data Sheet.

REFERENCES

1. TU BY 400051902.017-2015. Normal Butane Fraction. Specification.
2. GOST 12.1.007-76 Occupational Safety Standards. Noxious Substances. Classification and General Safety Requirements.

3. GOST 1510-84 Petroleum and Petroleum Products. Marking, Packing, Transportation and Storage.
4. Korolchenko A.Y., Korolchenko D.A., Fire-and-explosion hazard of substances and materials and suppressants. 2 parts. Moscow, Pozhnauka, 2004, pp. 713, 775.
5. Fire Safety Regulations of the Republic of Belarus. FSR of Belarus 01-2014, approved by Resolution of Ministry of Emergency Situations of the Republic of Belarus of 15.03.2014 No.3 (as amended by MES Resolution of 26.08.2014 No.25).
6. Regulations for the Carriage of Dangerous Goods by Rail, approved by the Fifteenth Meeting of the Council for Rail Transport of 05.04.1996 (as amended in 2009).
7. GOST 31340- 2007. Precautionary Labeling of Chemicals. General Requirements.
8. GOST 19433-88 Dangerous Goods. Classification and Labeling.
9. Regulations for the Safe Carriage of Dangerous Goods by Road in the Republic of Belarus. Resolution of the Ministry of Emergency Situations of the Republic of Belarus of 08.12.2010 No.61 (as amended by MES Resolution of 12.03.2015 No.6).
10. Fire safety and industrial hygiene in the oil and gas production and gas processing industries. Rules and regulations, 1990.
11. GOST 12.4.011-89 Occupational Safety Standards. Means of Protection. General Requirements and Classification.
12. Petrochemist's Handbook. Vol 1&2. Ogorodnikov, S.K., Ed., Leningrad, Khimiya, 1978, 496 p.
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15. V. N. Borisyuk, V. I. Ring et al. Safety rules and procedures for response to emergency situations involving dangerous goods carried by rail in the Republic of Belarus. Minsk, Tehnalogiya, 1999, 429 p.
16. Procedure for accumulation, transportation, neutralization and burying of toxic industrial waste. Sanitary requirements. Moscow, 1985.
17. Safe handling of waste. Collection of normative and methodological documents. I.A.Kopaysov, Ed. Saint-Petersburg, REC Petrokhimtekhnologiya. Firm Integral Co., Ltd., 448 p.
18. GOST 12.4.034-2001 (EN 133-90) Occupational Safety Standards. Respiratory Protective Equipment. Classification and Marking.
19. Regulations for the Safe Carriage of Dangerous Goods by Rail in the Republic of Belarus. Minsk. 2004, 46 p.
20. GOST 12.4.068-79 Occupational Safety Standards. Dermatological Personal Protective Equipment. Classification and General Requirements.
21. Harmful Chemicals. Natural Organic Compounds. Reference edition. Vol. 7 / ed. by V.A.Filov, Y.I.Museychuk, B.A.Ivin. Saint-Petersburg, SPHFA Publ., SPA "Mir i Semya-85." 1998, 507 p.
22. Emergency cards for dangerous goods carried by railways of the CIS, Republic of Latvia, Republic of Lithuania, Republic of Estonia, adopted at the 48th session of the Council for Rail Transport of the Commonwealth of Independent States, as amended. 2008.
23. GOST 12.4.111-82 Occupational Safety Standards. Men's Overalls for Oil and Oil Products Protection. Specifications.
24. GOST 12.4.112-82 Occupational Safety Standards. Women's Overalls for Oil and Oil Products Protection. Specifications.
25. GOST 14192-96 Marking of Cargoes.

26. GOST 17.4.2.02-83 Nature Protection. Soils. Nomenclature of Suitability Characteristics of Disturbed Rich Soil Layer to be Backfilled.
28. Hygienic standards 2.1.5.10-20-2003 – Tentative Allowable Concentrations (TAC) of Chemicals at Domestic and Potable Water Bodies.
29. Hygienic standards 2.1.5.10-21-2003 – Maximum Permissible Concentrations (MPC) of Chemicals at Domestic and Potable Water Bodies.
30. Hygienic standards 2.1.5.10-29-2003 – Maximum Permissible Concentrations (MPC) and Tentative Safe Exposure Levels (TSL) of Chemicals at Domestic and Potable Water Bodies.
31. Hygienic standards 2.1.7.12-1-2004 – List of Maximum Permissible Concentrations (MPC) and Tentative Allowable Concentrations (TAC) of Chemicals in Soil.
32. Sanitary rules, regulations and hygienic standards "List of Regulated Workplace Air Pollutants" approved by the Decree of the Ministry of Health of the Republic of Belarus of 31.12.2008, No. 240.
33. TKP 238-2010 (02190) Organization and carrying out of work in case of emergencies involving dangerous goods during transportation thereof on the territory of the Republic of Belarus.
34. Rates of maximum permissible concentrations of pollutants in ambient air, approved by the Decree of the Ministry of Health of the Republic of Belarus of 30.12.2010, No. 186 (as amended on 08.08.2013 Rev. No.71).