

# ASSESSMENT AND RISK MANAGEMENT HEALTH AND SAFETY IN MEDICAL HEALTH ORGANIZATION

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## HYGIENIC ASSESSMENT OF WORKING CONDITIONS AND OCCUPATIONAL RISK FOR WORKERS HEALTH AT RAILWAY TRANSPORT OBJECTS

**V.A. Loginova**

Federal Service for Surveillance over Consumer Rights Protection and Human Wellbeing, Railway transport office, 17 Dubininskaya Str., Moscow, 115054, Russian Federation

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*We performed hygienic assessment of working conditions at railway transport over 2011–2015. We detected a decreasing trend in specific weight of working places where physical factors were higher than hygienic standards and where steam and gases content in working area air was higher than maximum permissible concentrations (MPC). Working conditions of locomotive teams remain most unfavorable as per risk factors. We detected that a priori occupation risk for locomotive teams was characterized with parameters varying from moderate to considerable ones. Occupational noise was determined as a priority risk factor making working conditions category a hazardous one and it corresponded to occupational morbidity structure. We detected that sensorineural hearing loss took a leading place in morbidity both in the branch in general and among locomotive team workers. We also clarified that such workers as engine drivers and their assistants (up to 43 %) had the greatest specific weight among railway workers with occupational diseases; occupational morbidity among locomotive team workers amounted to 3.0 per 10,000 workers in 2015 while average morbidity among all railway workers amounted to only 1.32 per 10,000 workers. We revealed that occupational diseases were most frequently detected in workers aged 51–60 (51.9 % in 2014) who had worked under hazardous occupational factors influence for longer than 15 years. While there was an overall decreasing trend in occupational morbidity in the branch in 2011–2015 from 1.68 to 1.32 per 10,000 workers, we detected a brunch peculiarity in the risk group, namely, an unsatisfactory trend for growing share of workers with occupational diseases aged 31–40 (from 2.6 % in 2011 to 12 % in 2014) and it requires special attention in terms of risk management.*

**Key words:** working conditions; hazardous occupational factors; occupational diseases; railway transport; occupational noise; occupational risk.

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Occupational pathology risks in professional activity are greatly affected by a complex of occupational factors at working place. Studies show that occupational environment factors have an adverse effect on worker's organism, and are the risk factors contributing to diseases development [7, 8, 16, 17].

Assessing the harmful effects on an employee due to certain factors in labor process for the occupational period, and working out mechanisms to manage these factors in order to reduce to acceptable risk levels allows for

employees occupational health, and leads to saving labor resources. The specifics and nature of occupational activity at railway transport facilities are such that a considerable number of harmful occupational factors have effect on employees, leading to deterioration in their health and occupational morbidity [3, 6, 9, 10, 15].

**The research goal** was to study dynamics in sanitary and epidemiological situation at railway transport objects with assessment of a priori occupational risk to workers health and

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Ó Loginova V.A., 2017

**Vera A. Loginova** – Deputy head (e-mail: [va-loginova@mail.ru](mailto:va-loginova@mail.ru); tel. +7 (495) 633-27-19).

indices of occupational morbidity.

**Materials and methods.** Based on the data of state statistical reporting of Rosпотребнадзор bodies and institutions for railway transport over 2011-2015, we studied the dynamics in the sanitary-epidemiological situation and occupational morbidity at railway transport facilities. We analyzed occupational environment and labor process factors, carried out general hygienic assessment of the working conditions in accordance with G.2.2.2006-05 "Guidelines for hygienic assessment of the occupational environment and labor process factors. Criteria for working conditions and their classification" [14]. We made an assessment of a priori occupational risk, according to G.2.2.1766-03 "Guidelines for assessment of occupational health risk for personnel. Organizational and methodological background, principles and criteria for assessment" [13].

**Results and discussion.** For the period under study, 2011-2015, among the objects related to railway traffic (such as factories, locomotive and wagon repair depots, railway service facilities, communications, power supply), we noted a decrease in the proportion of objects classified to Group III, in terms of sanitary and epidemiological well-being (extremely unsatisfactory): from 23.1% in 2011 to 19.0% in 2015. We detected a decreasing trend in the specific weight of working places that do not meet hygienic standards in terms of noise level: from 28.1 to 22.5%; by the level of vibration: from 24.2 to 12.0%; as per microclimate parameters: from 6.3 to 3.4%; per lighting parameters: from 19.3 to 17.1% [2].

According to laboratory data for air in the working area, over 2011-2015, there is a tendency to decrease in the specific weight of the steams and gases samples with the exceeded maximum permissible concentrations (MPC), both in general, as well as per substances belonging to the 1<sup>st</sup> and 2<sup>nd</sup> hazard category, from 4.6 to 2.9% and from 4.2 to 2.3% respectively. At the same time, the specific weight of the working area samples of air with dust and aerosols above the MPC increased from 13.6 to 16.8%, including substances of the 1<sup>st</sup> and 2<sup>nd</sup> hazard categories: from 14.2 to 20.9% [2].

The review of control and surveillance activities showed that the main reasons for unsatisfactory working conditions at production facilities are long operating periods and high deterioration in machine tools and other equipment (metalworking, woodworking, forging machines, etc.); absence or disruption of ventilation at working places, or ventilation inappropriate to production processes (incorrect technical solutions); unbalanced thermal conditions (not enough heaters in the shops, operating air curtains are not interlocked with opening gates); damages to ventilation during gas welding at non-fixed working places, lack of insulation for the most harmful processes.

The most unfavorable working environment is working conditions of locomotive crews: those who work on diesel locomotives, electric locomotives, electric trains and self-powered railway equipment. Data analysis for 2006-2015 showed the exceedance of hygienic standards in physical factors. At the same time, during the last 5 years (2011-2015) there has been an improvement in the working environment in locomotives: the specific weight of cabins where physical factors do not meet standards decreased from 53 to 26%; according to the noise level non-compliant with hygienic standards, the number of cabins in different years ranged from 20.2 to 45.1% of the total cabins under survey. It should be noted that the specific weight of cabins with the noise level exceeding the maximum permissible one (MPL) by up to 5 dB (of those which do not correspond to hygienic noise standards) ranged from 69.0 to 96.4%. The noise level excess by 5-10 dBA was observed in 13.4-3.01% of the surveyed cabins, by 10-15 dBA in 2.3-11.0%. As per vibration level, the proportion of cabins with MPL excess made 3.9 to 35.6%. The number of cabins (of those that did not meet hygienic requirements in terms of vibration) exceeding the vibration MPL by up to 5 dB made 67.2 to 90.0%; exceeding the vibration MPL by 5-10 dB: from 2.7 to 87.5%; by 10-15 dB: from 5.6 to 30.1%.

According to hygienic criteria [14], the greatest share of working places in locomotive cabins, in terms of noise and vibration levels,

corresponds to the category of hazardous working conditions of the 1<sup>st</sup> and 2<sup>nd</sup> class. Depending thereon, according to G. 2.2.1766-03 [13], a priori occupational risk for locomotive teams staff is characterized as small (moderate) and medium (considerable), and requires measures to reduce risk [1].

According to risk assessment methodology applied in Rospotrebnadzor bodies and institutions, all occupational factors and health disorders are subject to compulsory recording and assessment, which is used as the basis for "Assessment criteria for occupational risks to the Russian Railways staff, directly involved in trains traffic" [16]. In line with this document, at final assessment, the occupational risk for engine drivers and their assistants is set at a very high level [7].

The occupational morbidity level has a pronounced dynamics to decrease. From 2011 to 2015, the number of detected occupational diseases decreased from 152 to 104 cases or, in other words, decreased from 1.68 to 1.32 per 10 thousand employees (with the Russian national average of 1.65 per 10 thousand employees in 2015) [10].

For the analyzed period, occupational morbidity structure by nosological forms did not change significantly. The highest specific weight is made up of engine drivers and assistants to engine drivers: 32.9 - 43.0%, as well as track workers: 19.3 - 24.3%. Among the diseases, sensorineural hearing loss takes the leading place (up to 73%); the second – diseases of dust etiology (up to 13%); the third is for vibration disease (up to 5%). Diseases of peripheral nervous system (PNS) and musculoskeletal system rank fourth (up to 9%).

The occupational morbidity structure for locomotive crews has some specific features, which is determined by the nature of working conditions. Among the diseases, the major share belongs to neurosensory hearing loss (93.4%), vibration disease (9.4%), peripheral nervous system and musculoskeletal system diseases (1.3%) [6].

Occupational diseases among all personnel employed at JSC "Russian Railways" are most often registered in the age group of 51-60

with the occupational time-period under influence of hazardous factors for longer than 15 years. In 2011-2015, the proportion of workers in this group ranged from 51.9% in 2014 to 63.5% in 2015. One of the reasons thereto one can consider the workers intention to keep their jobs until retirement, which is explained by the desire to get compensation for work under harmful working conditions. However, there is an unsatisfactory trend to increasing share of workers with occupational diseases in the age group of 31-40 (in 2011: 2.6%, in 2014: 12.0%). This may indicate a significant impact of harmful occupational factors at a relatively short occupational period under harmful working conditions [2]. A special feature of occupational pathology is the detection of occupational diseases in late, neglected and clinically pronounced stages, which disrupt employee's working ability [13].

The detection of occupational diseases takes place mainly during medical examinations (81.5-94%). This suggests that workers do not seek medical help at first manifestations of a disease eventually related to occupation. Workers with a long occupational period under harmful working conditions are subject to in-depth medical examination. Such an examination is carried out in specialized medical organizations according to cl. 37, Appendix No.3 to the Order No.302n by the Ministry of Healthcare and Social Development of Russian Federation ddt. 12.04.2011 "On Approving Lists of Harmful and/or Hazardous Occupational Factors and Works in Performance of which the compulsory preliminary and regular medical examinations (medical screenings) are conducted, and the order of mandatory preliminary and regular medical examinations (screenings) for employees involved in heavy works and works under harmful and (or) hazardous working conditions". For 2013-2015, within the railways system, 1,556 workers exposed to harmful occupational factors for more than 5 years were subject to in-depth medical examination, only 57 of them, that made 3.7%, were actually examined.

**Conclusions.** Despite the fact that railway transport objects (both the facilities related to

train traffic maintenance, as well as passenger trains cabins (including motor-car) and cargo rolling stock), detect the decreasing trend in the specific weight of the working places where physical factors exceed hygienic standards and MPC levels in terms of steams and gases content in the working area air, as well as such physical factor as occupational environment noise, one can determine the category for working conditions as harmful, and identify the structure of occupational pathology.

The leading place belongs to sensorineural hearing loss – up to 73%, the second place falls to diseases of dust etiology – up to 13%, vibration sickness ranks third – up to 5%, peripheral nervous system (PNS) and musculoskeletal disorders rank fourth – up to 9 %.

The occupational morbidity structure for locomotive crews has some peculiarities, which is determined by the nature of working conditions. In the structure of occupational diseases, among workers of locomotive crews, the largest share belongs to neurosensory deafness - 93.4%.

The most unfavorable occupational environment is working conditions of locomotive

crews: those who work on diesel locomotives, electric locomotives, electric trains and self-powered railway equipment. A priori occupational risk here is characterized from moderate to considerable. This determined the greatest specific weight of diseases in locomotive teams in the overall structure of occupational diseases among workers in the railway branch (occupational morbidity index in 2015 made 3.0 per 10 thousand workers at the overall index for the whole railways system of 1.32 per 10,000 workers).

With the general decreasing number of occupational diseases in the railway branch from 2011 to 2015, from 1.68 to 1.32 per 10 thousand employees, there is a markedly unsatisfactory tendency to increasing share of workers with occupational diseases aged 31-40: from 2.6 % (in 2011) to 12.0% (in 2014). The decrease in the registered occupational pathology under a slight improvement in the occupational environment hygienic conditions speaks for a low quality of regular medical examinations and failure of the preventive focus in occupational medicine.

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