ANALYSIS OF OCCUPATIONAL ACCIDENTS IN INDUSTRIAL FIELDS USING WELDER OCCUPATION

Ph.D student, Eng. **Valentin PÎRVU,** National University of Science and Technology Politehnica Bucharest, ROMANIA, vpirvu75@gmail.com
Prof.Ph.D.Eng, **Corneliu RONTESCU,** National University of Science and Technology Politehnica Bucharest, ROMANIA, corneliu.rontescu@upb.ro
Lecturer, Ph.D, Eng. **Ana-Maria BOGATU*,** National University of Science and Technology Politehnica Bucharest, ana_maria.bogatu@upb.ro
Assoc.Prof, Ph.D, Eng. **Dumitru-Titi CICIC,** ROMANIA,National University of Science and Technology Politehnica Bucharest, ROMANIA, dumitru.cicic@upb.com

Abstract: *The continuous increase in consumption and material needs has led to the need to increase the level of production at national, European and global level. Increasing production can be done by introducing mechanization processes but also by increasing the number of employees and working hours. All these actions increase the probability of occupational accidents. The paper presents research on the identification of industrial fields that use the welder occupation in the manufacturing processes. Considering the identified fields, based on available statistics at national and European level, the paper presents the situation of fatal and non-fatal occupational accidents both at overall level and specific to the industrial fields using the welder occupation.*

Key words: occupational accident, welder occupation, work environment.

1. INTRODUCTION

In the case of welding processes, the working environment varies depending on the areas of manufacturing and use of the resulting welded products. From this point of view, we may encounter working conditions with high temperatures, high pressures, oversized components, work at height, etc. Another common problem is related to the toxicity of the materials used in the production of welded joints, but also of the working environments. All these conditions can increase the risk of occupational accidents. As a result, welding can be a high-risk activity and can lead to various types of occupational accidents: burns, eye and respiratory injuries, asphyxiation, mechanical injuries.

According to the legislation in force, an occupational accident is defined as a violent injury to the body, as well as acute occupational intoxication, which occurs during the work process or while performing work duties and which causes temporary work incapacity of at least 3 calendar days, disability or death [1,2].

Occupational accidents are classified according to the consequences and the number of people injured in [3,4]:

- accidents resulting in temporary work incapacity of at least 3 calendar days;
- accidents leading to invalidity;
- fatal accidents;
- collective accidents, when at least three people are injured at the same time and from the same cause.

The paper presents research carried out on the identification of the main industrial areas using the welder occupation. The identification of the main fields was carried out based on questionnaires sent to organizations using welder occupation, but also considering the information provided by the Statistical Classification of Economic Activities in the European Community (NACE) and Classification of Activities in the National Economy in Romania (CAEN) codes. Considering the identified fields, the paper presents the situation of fatal and non-fatal occupational accidents, in the European Union but also in Romania, in general but also in particular in the industrial fields mentioned above.

2. INDUSTRIAL FIELDS IN WHICH THE WELDER OCCUPATION IS USED

At national or European level there are no statistics on occupational accidents for the welder occupation. Considering this aspect, to create a general picture of the possible occupational accidents for the welder occupation, the research considered the statistics available at national and European level on occupational accidents for the fields using the welder occupation.

One of the main goals of the research was to identify the main industrial branches in Romania, which use welding processes in their production processes. Based on the information collected after designing, carrying out and sending a questionnaire to organizations carrying out welding activities. The questionnaire was sent to 280 organizations having 80 respondents, the results of which are shown in Figure 1.

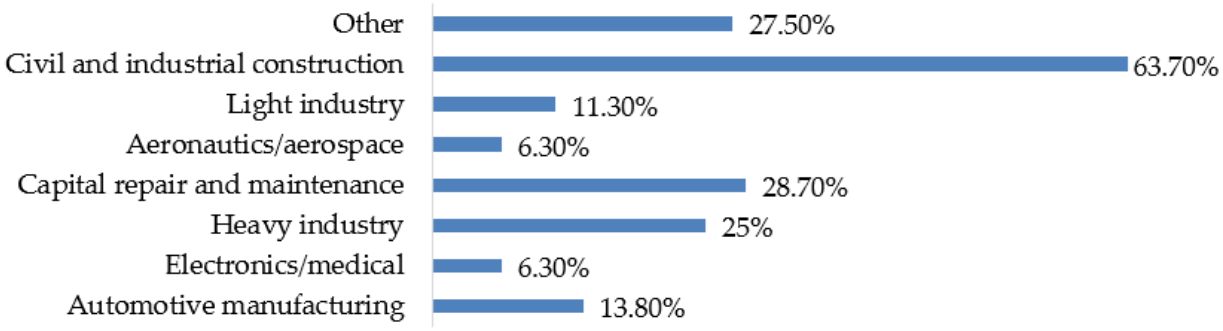

Fig. 1. Industry branches to which welded structures manufacturing organizations belong.

From Figure 1, one can observe that the main industries using welders in production are: Civil and industrial construction, Capital repairs and maintenance, Heavy industry, Automotive manufacturing. In the "Other" category, 23 responses were identified which are not significant for this study.

The second identification analysis of the fields using the welder occupation was based on the information provided by the Statistical Classification of Economic Activities in the European Community (NACE) and Classification of Activities in the National Economy in Romania (CAEN) codes specific to these branches were identified in the paper. Table 1 and table 2 present the classification of the industrial branches who used welder occupation, according to NACE and CAEN code.

Table 1. Classification of industrial branches according to NACE codes.

Industry branch	NACE Code	Name	NACE Code detailed
Civil and industrial construction	F41	Construction of buildings	F41.2.0
	F42	Civil engineering	F42.2.1
Capital repairs and maintenance	C33	Repair and installation of machinery and equipment	C33.1.1
			C33.1.2
Heavy industry	C25	Manufacture of fabricated metal products, except machinery and equipment	C25.1.1
			C25.2.1
			C25.2.9
Automotive manufacturing	C29	Manufacture of motor vehicles, trailers and semi-trailers	C29.1.0
			C29.2.0

Table 2. Classification of industrial CAEN codes.

Industry branch	Name	CAEN Code
Civil and industrial construction	Construction of residential and non-residential buildings	4120
	Construction of utility projects for fluids	4221
Capital repairs and maintenance	Repair of fabricated metal products	3311
	Repair of machinery	3312
Heavy industry	Manufacture of metal structures and parts of structures	2511
	Manufacture of central heating radiators and boilers	2521
	Manufacture of other tanks, reservoirs and containers of metal	2529
Automotive manufacturing	Manufacture of motor vehicles	2910
	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	2920

3. ANALYSIS OF OCCUPATIONAL ACCIDENTS FOR FIELDS USING THE WELDER OCCUPATION

The number of occupational accidents is directly influenced by the conditions offered by employers but also by the total number of employees. Table 3 shows the total number of workers at European Union level, respectively the share of non-fatal accidents at work in relation to the total number of workers in each year from 2012 to 2021 [5].

Table 3. Total number of workers at European Union level and the fatal and non-fatal occupational accidents in relation to the total number of workers.

Year	Total number of workers	Number of non-fatal occupational accidents	Number of fatal occupational accidents
2012	212,558,179	2,937,737	3,757
2013	213,075,412	2,936,708	3,408
2014	213,766,443	3,031,648	3,562
2015	214,073,147	3,030,077	3,643
2016	215,305,164	3,112,736	3,336
2017	216,450,258	3,116,691	3,272
2018	217,132,627	3,124,828	3,332
2019	217,958,466	3,140,950	3,408
2020	215,140,769	2,735,566	3,358
2021	216,560,573	2,886,507	3,347

Figure 2 presents the Non-fatal occupational accidents by NACE in European Union - All NACE Activities.

Figure 2 shows the situation of non-fatal occupational accidents in the European Union (27 countries, excluding the UK) for all sectors of activity (according to NACE code) from 2012-2021 [6]. In terms of the evolution of the number of non-fatal occupational accidents reported at EU level, one can observe that in 2012 a total of 2937737 accidents occurred, followed by a small decrease in 2013, then a continuous increase in their number until 2019. The lowest number of non-fatal accidents was reported in the year 2020 (2735566), also justified by the pandemic situation at EU level.

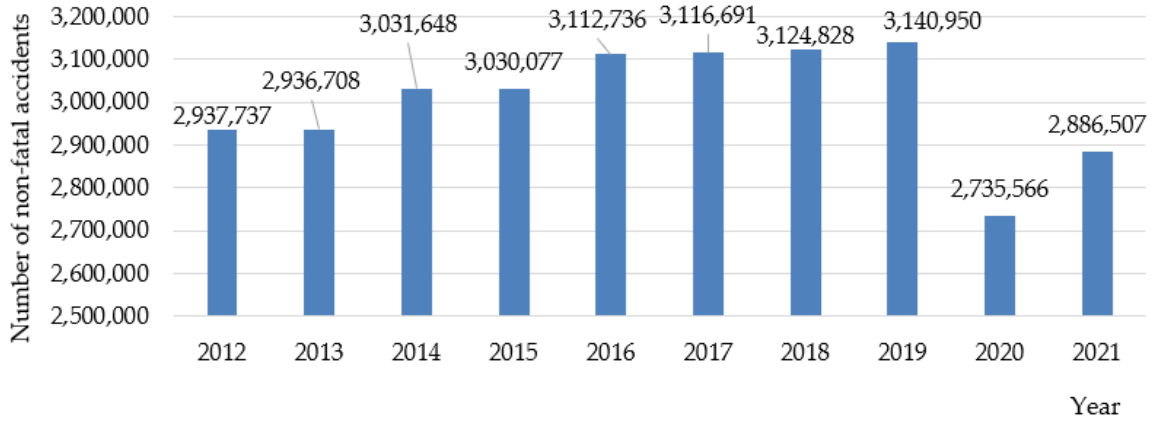

Fig. 2. Non-fatal occupational accidents by NACE in European Union - All NACE Activities [6].

Based on the data presented in Figure 2 and on the fields identified in Table 1 (according to NACE code), Figure 3 presents the situation of non-fatal accidents at EU level for fields using the welder occupation.

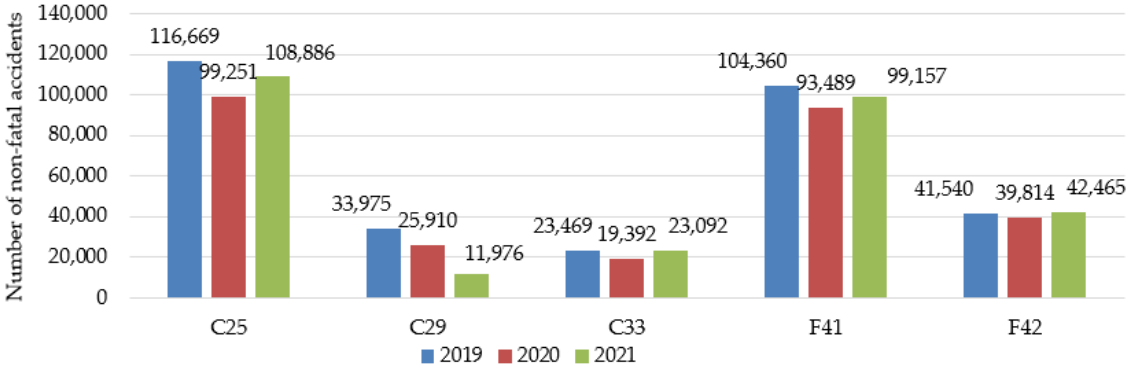

Fig. 3. Non-fatal occupational accidents in European Union by NACE Activities [7].

From Figure 3, which presents the situation of non-fatal accidents at EU level related to the industrial branches identified in Table 1, one can observe that in 2019 non-fatal occupational accidents in the "Manufacture of fabricated metal products, except machinery and equipment" branch (C25) that uses welders represent 3.71% of the total number of such accidents at EU level.

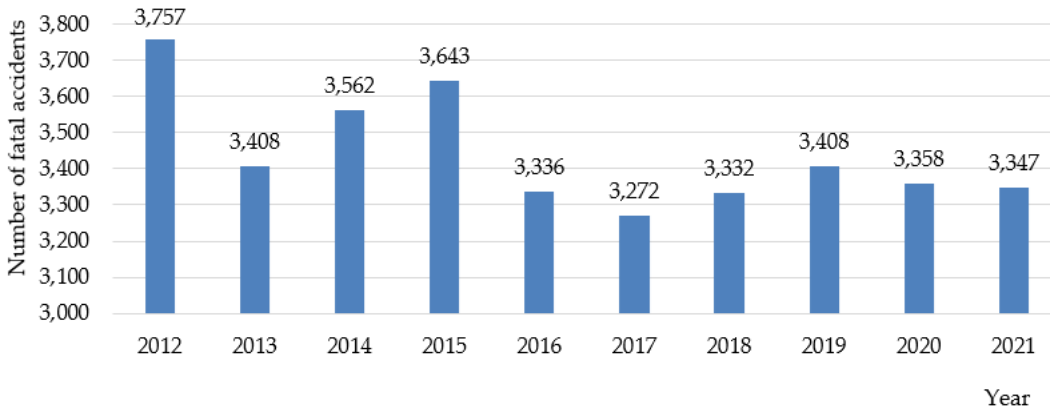

Fig. 4. Fatal occupational accidents by NACE in European Union - All NACE Activities [7].

Figure 4 presents the situation of fatal occupational accidents in the European Union (27 countries, excluding the UK) for all sectors of activity (according to NACE code) from 2012-2021 [7].

From the analysis of the data presented in Figure 4, one can observe that the highest number of fatal accidents was reported in 2012 (3,757) and the lowest in 2017 (3,272). There is an increasing trend in the number of accidents between the years 2013-2015 and 2017-2019 and a decreasing trend between the years 2015-2017 and 2019-2021. An irregular variation in the number of fatal accidents can be observed.

Figure 5 presents the situation of fatal occupational accidents at EU level for fields using the welder occupation, according to NACE code.

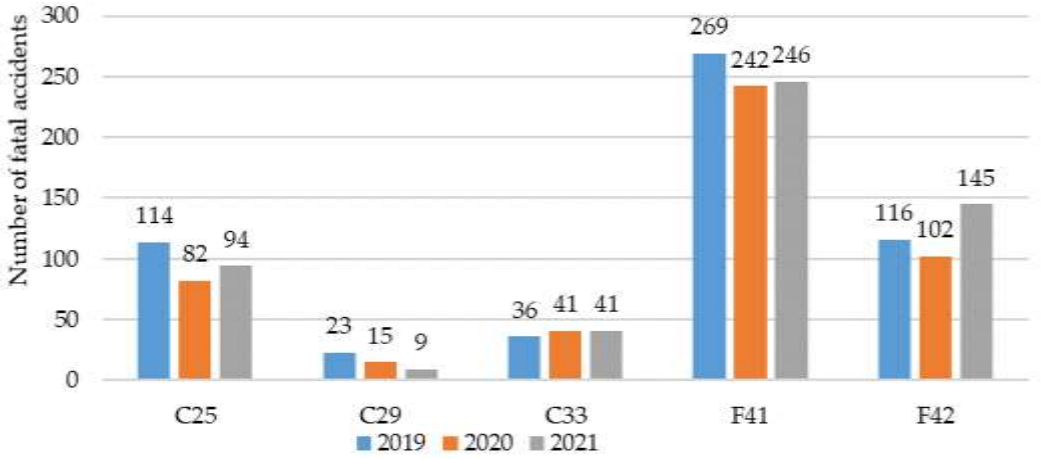

Fig. 5. Fatal occupational accidents in European Union by NACE [7].

From the analysis of the data presented in Figure 5 one can observe that in 2019 fatal occupational accidents in the "Construction of buildings" branch that uses welders represent 7.89% of the total number of such accidents at European Union level.

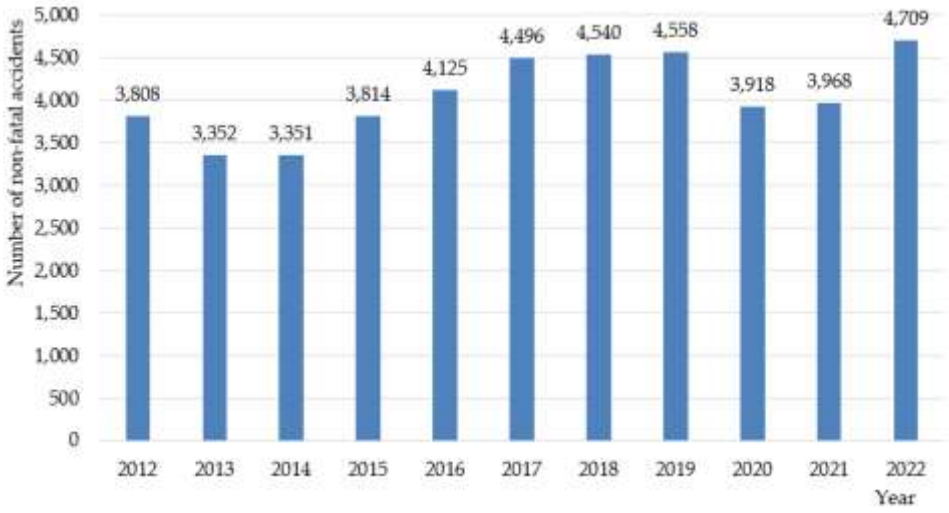

Fig. 6. Non-fatal occupational accidents by CAEN in Romania - All CAEN Activities [8].

Figure 6 presents the situation of accidents with temporary work incapacity (non-fatal) in Romania according to the official statistics presented by INS in the section "ACC102C - Persons injured at work by categories of occupational accidents and economic activities CAEN Rev.2. " for the 2012-2022 period. [8]

Based on the data presented in Figure 6 and on the fields identified in Table 2 (according to CAEN code), Figure 7 presents the situation of non-fatal accidents at national level for the fields using the welder occupation.

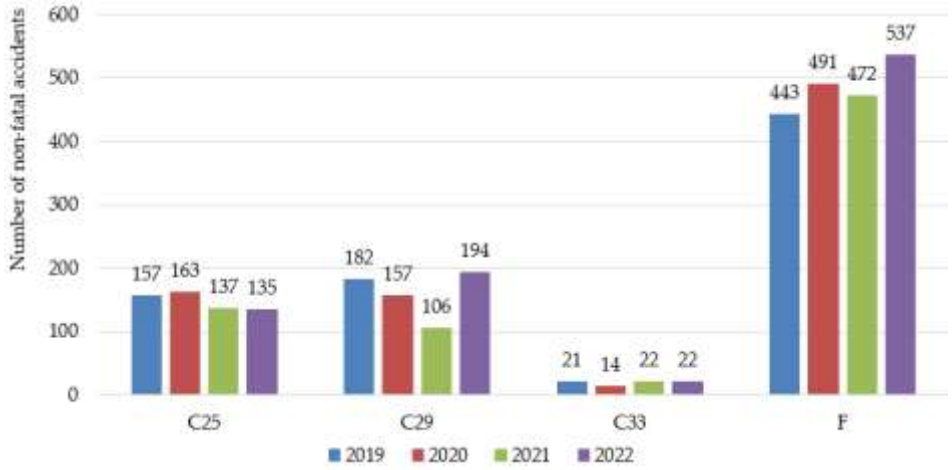

Fig. 7. Non-fatal occupational accidents in Romania by CAEN Activities [8].

From Figure 7, which presents the situation of non-fatal occupational accidents in Romania related to the industrial branches identified in Table 2 (in Romania, the statistics of occupational accidents are presented for the whole F Construction group, not broken down by sub-branches), one can observe that, in 2022, non-fatal occupational accidents in the "Construction" branch that uses welders represent 11.4% of the total number of such accidents at national level.

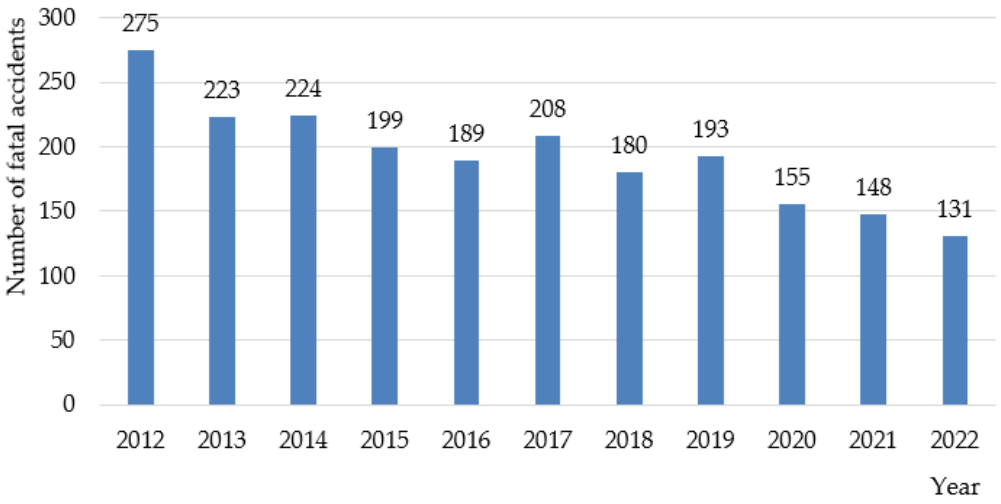

Fig. 8. Fatal occupational accidents by CAEN in Romania - All CAEN Activities [8].

Figure 8 presents the situation of fatal occupational accidents in Romania related to all sectors of activity (according to CAEN code) from 2019 to 2022. By referring to the 2019-2022 period, in terms of fatal accidents, a downward trend can be observed with a maximum number of 193 accidents recorded in 2019. The minimum number of fatal accidents was recorded in the year 2022, decreasing by about 33% compared to the year 2019 and about 53% lower than the number of accidents in 2012, the highest number reported in the period considered.

Figure 9 presents the fatal occupational accidents in Romania by CAEN, for the industrial fields using the welder occupation.

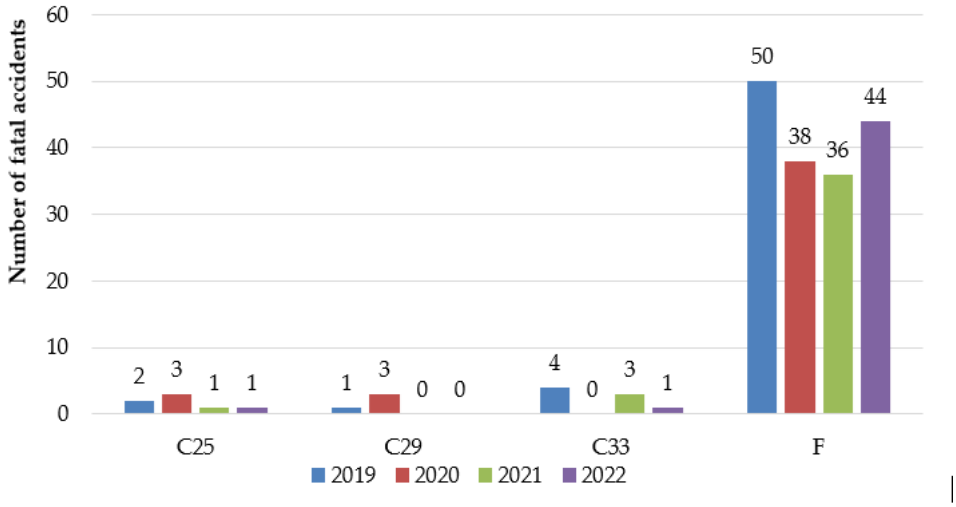

Fig. 9. Fatal occupational accidents in Romania by CAEN [8].

Following the analysis of the results presented in the previous figures, a decrease in the number of accidents during the SARS-CoV-2 pandemic can be observed, based on the cessation or decrease of production activity in the main industrial branches.

4. CONCLUSIONS

Following the research based on the questionnaire sent to economic agents in Romania, the four main industrial branches in which the welder occupation is present were identified: civil and industrial construction, capital repairs and maintenance, heavy industry and automotive manufacturing.

The paper presents a series of research on non-fatal and fatal occupational accidents, reported at EU and Romanian level, with a particularization of the industrial fields in which the welder occupation is found. Following the analysis of the data presented in the first part of the paper, one can observe, at EU level, a continuous increase in the number of non-fatal occupational accidents, due to the increase in the number of employees from 2012 to 2019, followed by a period of significant decrease due to the SARS-CoV-2 pandemic. The peak number of non-fatal occupational accidents reported at EU level was 3,140,950 in 2019, with a considerable decrease in 2020 to 2,735,566. In Romania, a situation similar to that found at EU level is observed, with the maximum value of the number of non-fatal occupational accidents being recorded in 2019 (4,558 accidents).

In terms of fatal accidents, recorded at EU and Romanian level, a similar trend can be observed as for non-fatal accidents, with an increase in their number in 2019, followed by a decrease during the pandemic period.

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