

Information Collection Request for
“Ingress/egress and work boot outsole wear investigation at surface mines”

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Part A: Justification

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List of Attachments

Appendix A – Applicable Laws and Regulations

Appendix B – 60 Day Federal Register Notice

Appendix B2- Response to 60 Day Federal Register Comment

Appendix C – Mobile equipment operator focus group guide

Appendix D – Mobile equipment operator interview guide

Appendix E – Mine management interview guide

Appendix F – Screening questionnaire

Appendix G – Preliminary survey for boot wear evaluation

Appendix H – Recurring survey for Boot Wear Evaluation

Appendix I – Final Survey for Boot Wear

Appendix J – Talent Waiver

Appendix K – Informed consent form for ingress/egress study

Appendix L – Informed consent form for boot outsole wear characteristics longitudinal study

Appendix M – Informed consent form for boot outsole wear characteristics

Appendix N – IRB Approval Letter (Ingres/Egress Study)

Appendix O – IRB Approval Letter (Boot Outsole Wear Characteristics study)

- This submission is for an extension. There is no additional burden or time than what was originally approved.
- The goal of this work is to investigate how ingress/egress systems on mobile equipment and personal protective footwear (work boots) used by miners may lead to slips, trips and falls.
- The resulting data will help identify components of the ingress/egress systems on mobile equipment that can be made safer and help determine when it is appropriate for mines to replace personal protective footwear.
- Data collection methods are varied and include a cross sectional study using interviews and focus groups and a longitudinal study using surveys.
- All data will be collected from surface mine workers within the United States.
- The data collection using interviews and focus groups has been completed, thematic analysis was used for analysis and a publication is being drafted based on the results to make mobile equipment ingress and egress safer.
- The extension is requested to help complete the longitudinal study and cross-sectional study using surveys. Inferential and descriptive statistics will be used for quantitative data collected using surveys including regression and ANOVA.

the ingress/egress system poses the greatest risk for STF. A better understanding of where, how and why STF incidents occur during ingress/egress on mobile equipment will lead to a better understanding of the problem which in turn will lead to improved designs of these systems.

Most mining companies replace footwear at a pre-determined interval or based on appearance and comfort (Chiou, Bhattacharya, & Succop, 1996) with little knowledge on the actual wear of the footwear and its influence on the likelihood of a slip, trip, and fall (STF) event. Although there have been attempts to quantify wear in industrial work based on wear pattern, tread pattern, and hardness (Chiou et al., 1996), there is a lack of knowledge in the mining industry on how quickly the outsoles of work boots wear, what sorts of wear occur, and how wear patterns influence the likelihood of slips. Hence, there is a need to investigate the appropriateness of mining footwear based on mine properties and worker activities and the performance and wear of work boot outsoles.

The goal of this work is to investigate how ingress egress systems on mobile equipment and personal protective footwear (boots) used by miners may lead to slips, trips and falls at stone, sand and gravel surface mining facilities. The project objective will be achieved through the following two specific aims.

1. Specific Aim 1: Identify elements of ingress/egress systems on haulage trucks and front end loaders that pose a risk of STFs and could lead to STF related injuries, worker behavior associated with STF incidents, and how purchasing/maintenance decisions are made for said systems.
2. Specific Aim 2: Provide empirical evidence for work boot wear and recommendations for work boot replacement.

Information Collection system

Specific Aim 1

For Specific Aim 1, semi-structured interviews and focus groups will be conducted with mobile equipment operators and interviews will be conducted with mine management. Refer to Appendix C, D and E for the focus group guide, mobile equipment interview guide and the mine management interview guide respectively. The focus groups guides and semi-structured interview guides provide a list of questions that are of interest; however, this list may not be exhaustive. If participants voluntarily talk about other areas not currently included, researchers may ask probing questions to gather more specific information.

Specific topic areas of interest for mobile equipment operators include: 1) experiences the participants may have had with slipping, tripping, or falling; 2) participant opinions of how and where miners may get injured while getting on and off mobile equipment; 3) general tasks conducted on the ingress/egress systems; 4) ways the ingress/egress systems could be improved; and 5) participant opinions of worker behavior associated with STF incidents. Specific topic areas of interest for mine management include: 1) experiences the participant may have had with operating mobile equipment; 2) participant opinions of how and where miners may get injured while getting on and off mobile equipment; 3) general tasks carried out on the ingress/egress systems and pre-shift/training related issues; and 4) how purchasing decisions are made for mobile equipment.

For both the focus groups and semi-structured interview basic demographic information including years of mining experience, years of experience with haul trucks/front end loaders and models of haul trucks/front end loaders operated most often in the past year will be collected.

Focus groups and semi-structured interviews will be conducted in a private space. For both the semi-structured interview and focus groups participants will be told to not mention any particular person's full name as part of the discussion and to use pseudo-names instead. If they inadvertently do so they will be reminded of the same, and any written record will be deleted immediately after the interview or focus group. The semi-structured interviews and focus groups will be audio recorded for further analysis of the discussion. All participants will be assigned a unique participant ID that will be used for all data collected including surveys.

This part of the study has been completed; data collection has ended, data has been analyzed and a publication is being drafted based on the results to identify elements of ingress/egress systems on mobile equipment that pose a risk of STFs. The publication also outlines a few ways to make mobile equipment ingress and egress safer.

Specific Aim 2

Specific Aim 2 can be divided into two distinct parts 1) a longitudinal study and 2) a cross section evaluation of boot outsole wear characteristics.

For the longitudinal study, participants will initially be screened for any lower limb disorders (Appendix F) and if eligible will be provided a pair of new work boots of their choice, in accordance with their respective mine requirements and policies. When participants are provided the new boots they will be requested to fill out a preliminary survey (Appendix G) and provide some basic demographic information including age, gender, height and weight, job title, previous work history including number of years at current job, in mining and total work experience, details of current work boots including make, model and type and details of slip, trip or fall events in the past 3 months. To better understand wear patterns and risks, study participants will be requested to fill out an recurring survey (Appendix H) bi-weekly that records the number of hours worked, work locations frequented, tasks performed and details of near miss events or slips and trips that may have occurred. Participants may be offered

multiple modalities to respond to the survey (in-person, on paper, over the telephone, via e-mail or using an online survey) to increase response rates. Researchers will also measure the boot outsoles at 2 to 3 month intervals for the length of the study. If the participant or the participating mine deems the boots are unfit for use before the end of the two-year recording period, the participant will be requested to fill out a final survey (Appendix I) that assesses why the boots were at the end of their life. All supplied boots will then be returned to NIOSH researchers for further analysis. All participants will be assigned a unique participant ID that will be used for all data collected including surveys.

The extension is requested to help complete data collection for the longitudinal study. New boots have been distributed, and all required preliminary surveys (Appendix G) have been completed. We have been tracking boots for over a year now using the bi-weekly recurring surveys (Appendix H), and would like to complete data collection to have the greatest impact. Bi-weekly recurring surveys (Appendix H) will continue to be used to record information and the final survey (Appendix I) will be distributed at the end of the study.

For the cross sectional study, participants' current work boots will be scanned and participants will be requested to fill out the preliminary survey (Appendix G) that includes basic demographic information including age, gender, height and weight, current job title, job title, previous work history including number of years at current job, in mining and total work experience, details of current work boots including make, model and type and details of slip, trip or fall events in the past 3 months. All participants will be assigned a unique participant ID that will be used for managing all data collected including surveys and boot images and scans.

The extension is requested to help complete data collection for the cross-sectional study. Due to the resources required for the longitudinal study, only limited data was collected from participants using the preliminary survey (Appendix G) as part of the cross-sectional study. This extension would help complete the cross-sectional study.

2. Purpose and Use of Information collection

Since mining is a hazardous environment, it is extremely important for NIOSH to collect this information as it is our goal to improve the health and safety of all stone, sand and gravel miners. Although others have identified ingress/egress systems as large contributors to equipment-related injuries, there has been little research to identify what features of the ingress/egress system pose a risk for STF. Identifying features of the ingress/egress system that may lead to slip, trip and fall accidents will help identify components of the ingress/egress system that can be made safer by the manufacturers, allow mining companies to make better purchasing decisions and encourage the acquisition of systems with better slip and fall protection. For Specific Aim 1, participants will only be requested to participate in one semi-structured interview or focus groups.

Data collection for specific Aim 1 has been completed. The methods adopted were adequate to address the research questions, and based on a thematic analysis of the data, we were able to identify elements of ingress/egress systems on mobile equipment that pose a risk of STFs. The findings of this work were validated against findings from an analysis of MSHA injury data related to front-end loaders (Nasarwanji, Pollard & Porter, 2018). A publication is being drafted based on the results that also includes ways to make mobile equipment ingress and egress safer.

The timing of the replacement of worn footwear is often arbitrary, based either on subjective opinions or on a set schedule. Tracking actual boot outsole wear along with work carried out and slip, trip and fall events would help identify work areas where it is necessary to modify the replacement frequency to better suit the working conditions, improving the interface between the foot and the floor surface. This is the first study that will track boot outsole wear over time in an industrial setting. The knowledge gained from tracking boot outsole wear along with work carried out and slip, trip and fall events could inform

mine policy and practices by providing miners and mine managers with the knowledge to determine when to replace footwear based on measurable features of the boot sole. These findings along with other research could be used to evaluate footwear commonly worn by mine workers and can also be used to determine desirable and undesirable features of work boots based on mine characteristics or job activities.

For Specific Aim 2, for the longitudinal study of boot outsole wear participants will fill out 1) the screening questionnaire once at the beginning of the study, 2) the preliminary survey once at the beginning of the study, 2) the recurring survey bi-weekly for a period of up to two years, 3) the final survey once at the end the study. For the cross sectional study participants will fill out the preliminary survey once.

The extension is requested to complete Specific Aim 2. For the longitudinal study, new boots have been distributed, and all required preliminary surveys (Appendix G) have been completed so far. We have been tracking boots for over a year now using the bi-weekly recurring surveys (Appendix H). Preliminary results from data so far show the surveys developed are adequate at identifying key information related to boot wear and these preliminary results show that some occupations may wear boots out sooner than others as hypothesized. Completing the longitudinal study using the bi-weekly recurring surveys (Appendix H) and the final survey (Appendix I) would help provide more accurate results which could be beneficial to the mining industry to help determine an appropriate replacement frequency for personal protective footwear.

Due to the resources required for the longitudinal study, only limited data was collected from participants as part of the cross-sectional study. The little data collected indicates that the preliminary survey (Appendix G) is adequate to help quantify the wear on used boots recorded as part of the study. This extension would help complete the cross-sectional study.

3. Use of Improved Information Technology and Burden Reduction

Approximately 75% of the information collected via data collection instruments will require respondents to fill out surveys on paper or using electronic data collection technologies the other 25% will be through interviews, phone calls and focus group discussions with the researchers. Multiple modalities to respond to surveys have been selected so participants have the option to select one with the least burden to them. In order to reduce the burden to the miners, the majority of planned data collection will occur at the job site (surface mining facilities). This will eliminate any additional travel for miners who choose to take part in data collection.

4. Efforts to Identify Duplication and Use of Similar Information

There is no literature that exist that identify which features of haul truck and front end loader ingress/egress systems lead to STF for mobile equipment operators. Moore et al. (2009) found that nearly 50% of injuries occurred during the ingress/egress process, with most during egress, and indicated that research focusing on egress from mobile equipment would be beneficial to the mining industry. In addition, Santos, Porter, & Mayton (2010) identified that 46% of injuries occurred during egress and 23% occurred during ingress of the vehicle. However, in the surface mining industry it is still unclear which part of the ingress/egress system poses the greatest risk for STF.

This is the first study that will track boot outsole wear over time at surface mining facilities. Most companies replace footwear at a pre-determined interval, or based on appearance and comfort (Chiou, Bhattacharya, & Succop, 1996) with little knowledge on the actual wear of the footwear and its

influence on the likelihood of a STF event. Although there have been attempts to quantify wear in industrial work based on wear pattern, tread pattern, and hardness (Chiou et al., 1996), they have not been done longitudinally. There is a significant gap in knowledge in the mining industry on how quickly work boots wear, what sorts of wear occurs, and how wear patterns influence the likelihood of slips.

5. Impact on Small Businesses or Other Small Entities

An attempt will be made to recruit participants from larger mining operations; however, it will be necessary to also recruit participants employed by small mines to ensure that the sample is representative of the mining industry (operations with 50 or fewer employees). The research questionnaire will be held to the absolute minimum required for the intended use of the data. It is critical that the same number of questions be asked at each of the mines in the sample; otherwise, it will be impossible to make valid comparisons and to formulate appropriate conclusions and recommendations. For the study on ingress/egress systems for mobile equipment, semi-structured interviews will take no longer than 60 minutes and focus groups will take no longer than 90 minutes. Each survey for the study on boot wear will take no longer than 10 minutes. The burden over the length of the longitudinal study that will last up to 2 years will be 8.67 hours (10mins/survey * 52 recording periods (bi-weekly) = 520 minutes).

6. Consequences of Collecting the Information Less Frequently

Slips and falls of a person are the second largest contributor to non-fatal injuries in the U.S. mining industry. Slips and falls accounted for 21.2% of non-fatal injuries and led to 1,069,931 days lost from work during the period from 2003 to 2012. In addition, over the past 10 years the highest number of non-fatal incidents were attributed to slips and falls from mobile equipment (bulldozer, tractor, truck, front end loader) (n= 2234) for all metal and nonmetal commodities at surface facilities. Hence, there is an urgent need to collect information on elements of the work system that could potentially lead to slips, trips and falls.

Participants in the semi-structured interview will participate in one 60 minute session and participants in the focus groups will participate in one 90 minute session that will elicit the required information. For the study on boot wear, as the objective is evaluate wear longitudinally, it is essential to record wear and identify work exposure parameters such as work hours, locations visited and tasks along with slip trip and fall events and near misses on a regular basis. This data is crucial to identify occupations that may be at a higher risk for slips, trips and falls based on boot wear. It will also help identify if and when boots have reached the end of their usable life. Boot wear will be recorded every 2-3 months as during this period there could be a significant change in tread depths and capturing that information is one of the primary aims of the study. Collecting time spent at work, tasks performed and slip, trip or fall events is essential so it can be related to the boot wear. To avoid recall bias, where participants are unable to remember these key parameters, the time interval for the recurring survey has been set at 2 week. If a time period of great than two weeks were set, there is a likelihood of increased recall bias, leading to unreliable data that would not be usable for further analysis. An additional group of people will be surveyed only once regarding their work boots and recent slip, trip and fall history. This group will be used to get an idea of the types of boots and boot outsole wear characteristics commonly seen at surface mining facilities. As such, there will not be a need to track this group over time.

To our knowledge there are no legal obstacles to reduce the burden.

7. Special Circumstances Relating to the Guidelines of 5 CFR 1320.5

For specific aim 2 participants will be requested to respond to surveys more often than quarterly. Collecting time spent at work, tasks performed and slip, trip or fall events is essential so it can be related to the boot wear. To avoid recall bias, where participants are unable to remember these key parameters, the time interval for the recurring survey has been set at 2 week. If a time period of great than two weeks were set, there is a likelihood of increased recall bias, leading to unreliable data that would not be usable for further analysis.

Reporting information every two weeks has been beneficial so far. Data reported by participants is consistent and does not seem to show any recall bias in the form of missing information (blank entries), or the quality of information provided. It would be prudent to continue using bi-weekly reporting for the remainder of the study to ensure the quality of the data collected and the results.

8. Comments in Response to the Federal Register Notice and Efforts to Consult Outside the Agency

A

A 60-day Federal Register Notice was published in the *Federal Register* on March 20, 2019 vol. 84, No. 54, pp. 10313-10314 (see Appendix B). One public comment was received (Appendix B2). The comment outlined the safety record of the company that provided the comment in relation to ingress and egress from mobile equipment and provided a description of policies that the company follows for mobile equipment safety. The comment also indicates that the two year follow-up proposed for worn boots is more than the company's policy which is replacing boots every year. In response, NIOSH applauded the safety record of the company and highlighted the burden associated with mobile equipment ingress and egress to the mining industry. The response also indicated that the two year follow up for worn boots was to accommodate for other companies which may not have similar policies in place.

B

An extensive literature review was conducted. There were no personal consults outside NIOSH.

9. Explanation of Any Payment or Gift to Respondents

CDC/NIOSH researchers will not be offering any incentives or payment.

10. Assurance of Confidentiality Provided to Respondents

The NIOSH Information Systems Security Officer has reviewed this submission and determined that the Privacy Act does not apply. As part of this study, miners who volunteer to participate will not be asked to provide any form of identifying information. Thus, no personally identifiable information will be included in the data records. Photos, audio and videos may be recorded which could include a miner's likeness. As an added precaution, all participants will be assigned a Participant ID that will not be linked with a name or any other identifying information. All photos, audio and video will be tracked using this coding number. This data will be collected and used for internal purposes as well as in external communications. This data will only be used in external communications if a talent waiver is obtained (Appendix J). If a volunteer does not wish to have their likeness used in external communications, they

can choose to not sign this waiver and their data will only be seen by CDC/NIOSH researchers and used for internal research. All information provided by participants will be stored by CDC/NIOSH researchers in a secure manner unless compelled otherwise by law. The data will be analyzed in the aggregate form and no individual participants will be identified.

In terms of physical controls, the completed data collection instruments will be stored in a locked file cabinet at NIOSH’s Pittsburgh Mining Research Division (PMRD). This is a secure, gated facility with 24-hour security guard service. Only personnel with proper identification badges are allowed access to the site. All of the data will be entered and combined into data files that will be stored with technical safeguards in a secure, password-protected location on the CDC/NIOSH computer network. This computer network is only accessible to CDC/NIOSH employees. All networks at CDC/NIOSH are firewall protected and utilize a virtual private network. Access to this information will be restricted to researchers directly involved with the study and those who need to view the data. A training session will be conducted for all researchers about the data collection and how the data will be stored. At this training session, all researchers will be made aware of their responsibilities for protecting information being collected and maintained. At the end of the data collection, the surveys will be destroyed.

The system’s Security Plan defines the process for handling security incidents. The system’s team and the Office of the Chief Information Security Officer (OCISO) share the responsibilities for event monitoring and incident response. Direct reports of suspicious security or adverse privacy related events to the component’s Information Systems Security Officer, CDC helpdesk or to the CDC Incident Response Team. The CDC OCISO reports to the HHS Secure One Communications Center, which reports incidents to US-CERT as appropriate.

Technical Controls	Physical Controls	Administrative Controls
<ul style="list-style-type: none"> • Passwords • Firewall • Virtual Private Network (VPN) • Smart Cards 	<ul style="list-style-type: none"> • Security Guards • Identification Badges • Office and File Cabinet Locks 	<ul style="list-style-type: none"> • Access to data limited to researchers directly associated with task • Training Session

11. Justification for Sensitive Questions

The data collection materials have been reviewed and approved by the NIOSH Internal Review Board (IRB). The Informed Consent is included with this submission (see Appendix K, L, M). Original IRB approval, and the IRB closure notice (as that part of the data collection effort is complete) for Specific Aim 1, which includes interviews and focus-groups, is provided in Appendix N. Original IRB approval and the most recent IRB extension for Specific Aim 2, which includes the longitudinal study and cross-sectional study and is ongoing, is provided in Appendix O.

Participants will not be asked questions of a sensitive nature at any point during data collection.

12. Estimates of Annualized Burden Hours and Costs

A

The respondents targeted for this study are surface stone, sand and gravel miners. For the study on ingress and egress, 35 mobile equipment operators will participate in focus groups or semi-structured interviews that will last no longer than 90 minutes (1.5 hour) and 15 mine managers will participate in a semi-structured interview that lasts no longer than 60 minutes (1 hour). This part of the study has been completed.

For the study on boot wear 150 participants will fill out the preliminary survey once that will take no longer than 15 minutes. Only 50 participants will complete the recurring survey up to 52 times that will take no longer than 10 minutes each and the final survey once that will take no longer than 5 minutes. The extension is being sought to complete this work.

Data collection will be performed with various data collection instruments and the majority of data will be collected at the mine site in order to limit the burden on the mining organizations and the participants.

The following table provides an estimate of the total burden hours. The estimates are based on the researcher's previous experience conducting similar methods of data collection.

Estimated Total Burden Hours

Type of Respondent	Form Name	No. of Respondents	No. Responses per Respondent	Average Burden per Response (Hours)	Total Burden (Hours)
Ingress/egress study					
Mobile equipment operators	Mobile equipment operators focus group guide	25	1	75/60	31
Mobile equipment operators	Mobile equipment operators interview guide	10	1	45/60	8
Mine management	Mine management interview guide	15	1	45/60	11
Longitudinal boot outsole and boot outsole study					
Mine worker	Screening questionnaire	50	1	6/60	5
Mine worker	Informed consent form (Longitudinal boot outsole study)	50	1	12/60	10
Mine worker	Preliminary survey	150	1	15/60	38
Mine worker	Recurring survey	50	52	12/60	520
Mine worker	Final survey	50	1	6/60	5
Mine worker	Talent waiver	150	1	6/60	15
Total					643

B.

The estimated total cost for this information collection is \$13,335.

Estimated Total Burden Costs

Type of Respondent	Total Burden Hours	Median Hourly Wage Rate	Total Respondent Costs
For nonmetallic mineral mining and quarrying	643	\$20.74	\$13,335

This rate was based on the median hourly wage for Nonmetallic Mineral Mining and Quarrying from Bureau of Labor Statistics, May 2017 National Industry-Specific Occupational Employment and Wage Estimates (https://www.bls.gov/oes/current/naics4_212300.htm#00-0000) and set at \$20.74 per hour.

13. Estimates of Other total Annual Cost Burden to Respondents or Record Keepers

None.

14. Annualized Cost to the Federal Government

The time allotted for the project is three years. During this three-year period, instrument development, data collection, analysis and presentations are expected to occur. The estimated hourly cost to the Federal Government is \$33.00 per hour. This includes data collection by CDC/NIOSH employees, data analysis, and report writing. The hours designated for government staff were calculated as shown in the table below. The total cost average for a three-year period is \$411,000.

	Hours	Hourly Rate	Cost at Hourly Rate	Other Costs (data collection, etc.)	Total
Federal Government Employee	12,000	\$33.00	\$396,000	\$15,000	\$411,000

15. Explanation for Program Changes or Adjustments

Burden has not changed from the burden shown in the current inventory.

16. Plans for Tabulation and Publication and Project Time Schedule

Data analyses will be conducted over the life of the project. The project schedules below provide an estimate of data collection activities, analysis, and dissemination. We are requesting a 2 year extension of a currently approved ICR (OMB Control No. 0920-1125, Expiration Date 9/30/2019) to complete data collection associated with Specific Aim 2 related to the longitudinal study and the cross-sectional study.

Project Schedule for Extension:

Activity	Time Schedule
Specific Aim 1	
Recruitment, interviews, focus-groups, and data analysis have been completed	Already complete
Publish findings	6 months after OMB extension
Specific Aim 2	
Recruit participants: Longitudinal study	18 months after OMB extension
Recruit participants: Cross-sectional study	Already complete
Start longitudinal tracking of boot outsole characteristics	Already complete
Complete longitudinal tracking of boot outsole characteristics	6 months after OMB extension
Complete cross-sectional evaluation of boot outsole characteristics	20 months after OMB extension
Complete data analysis	22 months after OMB extension
Publish findings	24 months after OMB extension

Original Project Schedule:

Activity	Time Schedule
Specific Aim 1	
Recruit participants	3 months after OMB approval
Complete focus groups with mobile equipment operators	12 months after OMB approval
Complete semi-structured interviews with mobile equipment operators	12 months after OMB approval
Complete semi-structured interviews with mine management	12 months after OMB approval
Complete data analysis	18 months after OMB approval
Publish findings	24 months after OMB approval
Specific Aim 2	
Recruit participants	3 months after OMB approval

Start longitudinal tracking of boot outsole characteristics	3 months after OMB approval
Complete longitudinal tracking of boot outsole characteristics	30 months after OMB approval
Complete cross-sectional evaluation of boot outsole characteristics	30 months after OMB approval
Complete data analysis	33 months after OMB approval
Publish findings	36 months after OMB approval

Interview and focus-group data analysis has been completed using thematic analysis.

For survey data, descriptive analyses will be applied to the collected data. Descriptive statistics can include analyzing for mean, median and modal scores. Regression may also be used to relate boot outsole wear measures to survey responses.

17. Reason(s) Display of OMB Expiration Date is Inappropriate

Not applicable. The OMB expiration date will be displayed.

18. Exceptions to Certification for Paperwork Reduction Act Submissions

There are no exceptions to the certification.

References

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