


# Human Factors

in Accident Prevention

People / Environment / Work  
Force / Frequency / Posture

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## Human Factors in Accident Prevention

- **Instructor:** Diana Rodriguez Coca
- **Contact:** [dmrodri@okstate.edu](mailto:dmrodri@okstate.edu)
  - 520EN
  - 405-744-9631
- **Online Office Hours:**
  - By appointment (email instructor)

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## Instructor



Doctor of Philosophy, Industrial Engineering  
May 2020  
Oklahoma State University

Master of Science, Industrial Engineering  
March 2006  
Universidad de los Andes, Bogotá D.C. – Colombia

Bachelor of Science: Industrial Engineering  
September 2000  
Escuela Colombiana de Ingeniería, Bogotá D.C. – Colombia

**Research Interests**

- Hazardous materials
- Humanitarian logistics
- Redesign of Medical equipment
- Education in engineering

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## Human Factors in Accident Prevention

- Tuesdays Live streaming (9:50 am – 11:25 am)
  - Zoom
- Fridays recorded (2:00 pm - 3:35pm)
  - Canvas

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## Human Factors in Accident Prevention

**Class SWJT Monitor:** Wang Minghao  
**Email:** 1960204154@qq.com

**Class OSU Monitor:** Ryan Laronde  
**Email:** ryan.e.laronde@okstate.edu

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## Human Factors in Accident



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## Human Factors in Accident Prevention

Do you believe this topic is important for you?  
Why?

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## Healthy Use of Laptops Everywhere



<https://www.youtube.com/watch?v=xUz9K9d0E1>

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## Human Factors in Accident Prevention

**Catalog Description:**  
Human factors and workplace ergonomics as it relates to the prevention of accidents and workplace injuries. Fundamentals and techniques of task analysis.

**Prerequisites:**  
FPST 2023, STAT 2013, and GENT 2323 or ENSC 2113

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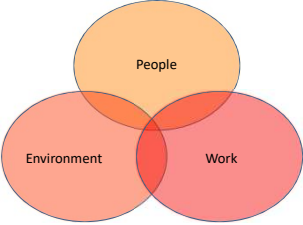
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## Ergonomics' Definition


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- The study of the relationship between people, work and the physical environment



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## Human Factors in Accident Prevention

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**Course Objectives:**

Topics include:

- Anthropometry,
- Biomechanics,
- Workplace design,
- Equipment design,
- Human reliability and human error,
- Manual materials handling
- Industrial Athlete/Fitness for Duty
- Environmental factors (noise, vibration, temperature extremes)

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## Human Factors in Accident Prevention


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**Learning Objectives:**

1. Understand the basic principles of **human movement and behavior** in the workplace.
2. Be aware of how **external conditions** affect people in the workplace.
3. Complete **mathematical analysis to assess risk** in the workplace.
4. Be familiar with the **standards** related to ergonomics and human factors.

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## Human Factors in Accident Prevention

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**Learning Outcomes:**

1. Identify common industrial processes in assembly and manufacturing and how they can be improved based on human factors.
2. Effective operation in teams.
3. Consider global workforce issues.
4. Able to apply state-of-the-art techniques to human factors and ergonomic issues.

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## Human Factors in Accident Prevention

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The final *exam* is a mandatory online comprehensive examination. All students will take the exam on Friday May 20 at 2:00 pm.

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## Human Factors in Accident Prevention

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**Required Texts:**

Stack, T., Wilhelmsen, C. A., Ostrom, L. T. (2016). Occupational Ergonomics: A Practical Approach. United Kingdom: Wiley.

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## Reading Assignments, Homework,

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Reading Assignments


- Listed in Course Outline/Schedule
- Expected to be completed before each class

Homework and Team Project

- Must be submitted in Canvas by established due date
- **Late work will not be accepted**
- Handwritten work will not be accepted unless specifically directed by instructor.

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## Team Project

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- Ergonomic Risk Factor Evaluations of High Risk Professions
- 5 students/team
  - Report
  - Presentation

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## Team Project


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Industry Specific Ergonomic Control Plan

1. Transportation
2. Toys manufacturing industry
3. Automobile manufacturing industry
4. Cement manufacturing industry
5. Chemical fertilizers manufacturing industry
6. Steel manufacturing industry
7. Textile manufacturing industry
8. Electronics manufacturing industry
9. Electricity production

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## Team Project

- Review of available Injury and Illness data for the occupation/product
- Review of common physical tasks associated with the profession/product
- Review of ergonomic risk factors associated with the tasks/products
- Suggested ergonomic controls that could be implemented to either eliminate or mitigate the risks
- Discussion of costs vs benefit of implementing controls vs. doing nothing

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## Human Factors in Accident Prevention

**Grading:**  
Course grades will be determined with the following:

	Qty	Percentage
Homework	10	20%
Team Project	1	35%
Midterm	1	20%
Final	1	25%
<b>Total</b>		<b>100%</b>

A – 85% - 100%  
B – 75% - 84%  
C – 60% - 74%  
F – 0% - 59%

An "F" grade will not count for transfer credit for any FPST curriculum course.

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OSU FPST 3213 - Human Factors in Accident Prevention  
Spring 2022

Week	Date	Topic(s)	Reading	Homework
1	3/1	Course Introduction	Syllabus	
	3/4	What is Ergonomics?	Ch2	HW1
2	3/8	NIOSH & CFI	Ch 13	HW2
	3/11	NIOSH & CFI (cont.)		
3	3/15	Physical & Environmental Stressors	Ch 10	HW3
	3/18	Physical & Environmental Stressors		
4	3/22	Physical & Environmental Stressors	Ch 6, Ch 15	
	3/25	Team Project - activity (computer)		
	3/29	Anthropometry	Ch 3	HW4
5	3/29	Anthropometry (cont.)		
	4/1	Bioelectrics	Ch 7	HW5
6	4/5	No class - Holiday		
	4/8	Midterm Exam		
7	4/12	Workplace Design	Ch 4, Ch 11	HW6
	4/15	Equipment Design	Ch 9	HW7
8	4/19	Work Design	Ch 5	HW8
	4/22	Human Reliability	Ch 8	
	4/26	Human Reliability (cont.)		
9	4/29	Manual Materials Handling / NIOSH	Ch 12	
10	5/3	No class - Holiday		
	5/6	NIOSH/NIEM Lifting Equations		HW9
11	5/10	Team Project - Presentations		
	5/13	Snork Tables/ REBA/ RULA	Ch 14	HW10
12	5/17	Team Project - Presentations (cont.)		
	5/20	Final Exam		

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## Student Responsibilities

A. Obtain Textbook & course materials

B. Complete Required Coursework

C. Attend Lectures and seminars


D. Avoid Academic Misconduct

E. Demonstrate Appropriate behavior

F. Communicate in a Professional Manner

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## Reminders

Distinguish Seminar Series is schedule for March 30 at 7 pm (OK time)

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5 minutes break

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# OSHA and Ergonomics



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# What does OSHA stand for?

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# OSHA

The Occupational Safety & Health Administration

- Created by the Williams-Steiger Occupational Safety & Health Act of 1970 (aka – “OSHAct”)
- Signed into law Dec. 29, 1970 by Richard Nixon



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## OSHA's Mission

To **save lives, prevent injuries and protect America's workers**

- By:
  - Providing for research
  - Establishing separate but dependent responsibilities and rights for employers/employees
  - Maintaining reporting & recordkeeping system
  - Establishing safety training programs
  - Developing & enforcing safety standards
  - Evaluating and approving state safety programs
- Through:
  - Strong, fair, and effective enforcement
  - Outreach, education, and compliance assistance
  - Partnerships and other cooperative programs

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## Intro to OSHA



Phillips Chemical Explosion - October 23, 1989

<https://www.youtube.com/watch?v=YBrXfwDgz0w>

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## History

- OSHA has been working on ergonomic issues for more than two decades

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# History

## OSHA Ergonomics Chronology

Early 1980s	OSHA begins discussing ergonomic interventions with labor, trade associations and professional organizations. OSHA issues citations to Hanes Knitwear and Samselite for <b>ergonomic hazards</b> .
August 1983	The OSHA Training Institute offers its <b>first course in ergonomics</b> .
May 1986	OSHA begins a pilot program to reduce back injuries through review of injury records during inspections and recommendations for job redesign using <b>NIOSH's Work Practices Guide for Manual Lifting</b> .
October 1986	The Agency publishes a Request for Information on approaches to reduce <b>back injuries</b> resulting from manual lifting. (37 FR 34192)
July 1990	OSHA/UAW/Ford corporate-wide settlement agreement commits Ford to reduce ergonomic hazards in 96 percent of its plants through a <b>model ergonomics program</b> .
August 1990	The Agency publishes <b>"Ergonomics Program Management Guidelines for Meatpacking Plants"</b> .
Fall 1990	OSHA creates the <b>Office of Ergonomics Support</b> and hires more ergonomists.
November 1990	OSHA/UAW/GM sign agreement bringing ergonomics programs to 138 GM plants employing more than 300,000 workers. Throughout the early 90s, OSHA signed <b>13 more corporate-wide settlement agreements to bring ergonomics programs to nearly half a million more workers</b> .
July 1991	OSHA publishes <b>"Ergonomics: The Study of Work,"</b> as part of a nationwide education and outreach program to raise awareness about ways to <b>reduce musculoskeletal disorders</b> .
July 1991	<b>More than 30 labor organizations</b> petition Secretary of Labor to issue an Emergency Temporary Standard.

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# History

## OSHA Ergonomics Chronology

January 1992	OSHA begins a special emphasis inspection program on ergonomic hazards in the <b>meatpacking industry</b> .
April 1992	Secretary of <b>Labor denies petition</b> .
August 1992	OSHA publishes an Advance Notice of Proposed Rulemaking on ergonomics.
1993	OSHA conducts a survey of general industry and construction employers to obtain information on the <b>extent of ergonomics programs</b> in industry and other issues.
March 1995	OSHA begins a series of meetings with stakeholders to discuss <b>approaches to a draft ergonomics standard</b> .
January 1997	OSHA/NIOSH conference on successful ergonomic programs held in Chicago.
April 1997	OSHA introduces the ergonomics web page on the Internet.
February 1998	OSHA begins a series of national stakeholder meetings about the draft ergonomics standard under development.
March 1998	OSHA <b>releases a video entitled "Ergonomic Programs That Work"</b> .
February 1999	OSHA begins small business (Small Business Regulatory Enforcement Fairness Act (SBREFA)) review of its draft ergonomics rule and makes draft regulatory text available to the public.
April 1999	OSHA's Assistant Secretary receives the SBREFA report on the draft ergonomics program proposal, and the Agency begins to address the concerns raised in that report.
November 1999	OSHA publishes <b>proposed ergonomics program standard</b> .

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# History

- November 23, 1999 OSHA released a proposed ergonomics standard...and it was terminated almost immediately
- [Ergonomics Program. | Occupational Safety and Health Administration \(osha.gov\)](#)

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Unknown, Unknown, "16." Accident Prevention Manual for Business & Industry: Administration and Programs, by Philip Hagan et al., National Safety Council, 2015, pp. 401-402.



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Why do you think it was terminated almost immediately????

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## OSHA

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- Policy
  - Before issuing any “citation” alleging ergonomic hazards, OSHA will consider the evidence and determine if:
    - whether an ergonomic hazard **exists**
    - whether that hazard is **recognized**
    - whether the hazard is causing, or is likely to cause, **serious physical harm** to employees
    - whether a feasible **means exists to reduce the hazard**

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## OSHA

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- Good faith efforts = no enforcement efforts
- No citations issued but ergonomic hazards exist
  - Issue an ergonomic hazard alert letters (EHAL)
    - Recommendations on how to reduce hazards
    - List of available resources
  - OSHA has an EHAL Follow-up procedure
    - Follow-up within 12 months of issuing an EHAL
    - [Ergonomic Hazard Alert Letter Follow-up Policy | Occupational Safety and Health Administration \(osha.gov\)](#)

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## OSHA Today

- Directives and Enforcement Policies
  - Inspection Guidance for Poultry Slaughtering and Poultry Processing Establishments. OSHA Memorandum, (October 28, 2015)
  - Inspection Guidance for Inpatient Healthcare Settings. OSHA Memorandum, (June 25, 2015)
  - Ergonomic Hazard Alert Letter Follow-up Policy. OSHA Directive CPL 02-00-144, (April 11, 2007)
- <https://www.osha.gov/SLTC/ergonomics/index.html>

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## OSHA

- Industry specific guidelines exist
  - What if you are not in one of those industries?
- What will the OSHA enforcement program entail?
  - OSHA has been assessing MSD-related issues in complaints, referrals, and targeted inspections

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## OSHA

- What about construction?
  - Where appropriate in the construction industry, OSHA will continue to evaluate MSD-related issues through targeted inspections and response to worker complaints

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## OSHA

- Will OSHA notify employers who have high rates of MSDs?
  - Yes. Part of Site Specific Targeting (SST)
  - Annual notification
    - Employers in the OSHA Data Initiative who report high Lost Workday Injury and Illness rates at their establishment(s)
    - Recommendation to seek assistance to address hazards

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## California Repetitive Motion Injury Prevention standard

- In 1993, Assembly Bill 110 Section 6357 to the Labor Code required the California Occupational Safety and Health Standards Board ("Standards Board") to adopt:
  - "[O]n or before January 1, 1995... standards for ergonomics in the workplace designed to minimize instances of injury from repetitive motion."

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## California Repetitive Motion Injury Prevention standard

- Mid-1993
  - the Standards Board was relying on the Division of Occupational Safety and Health's public Ergonomics Advisory Committee to develop an ergonomics standard for adoption
- Late 1993
  - the California Notice Registry contained the ergonomics standard (8 CCR Section 5110) proposed by the Division based on the public advisory committee
- Late 1994
  - the Standards Board voted down Section 5110
    - Two large public hearings
    - Over 6,500 written comments

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### California Repetitive Motion Injury Prevention standard

- Early 1995
  - Standards Board was sued by the California Labor Federation
    - Three named injured workers
    - Failure to "adopt" a standard "to minimize instances of injury from repetitive motion"
    - The Superior Court ordered the Standards Board to develop and adopt a standard December 1996

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### California Repetitive Motion Injury Prevention standard

- Late 1995, the Standards Board published a proposed repetitive motion standard
- Late 1996
  - Standards Board adopted 8 CCR Section 5110 entitled "Repetitive Motion Injuries."

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### California Repetitive Motion Injury Prevention standard

- The Office of Administrative Law approved 8 CCR Section 5110 on 3 June 1997, and the new repetitive motion injury standard became legally enforceable in California on 3 July 1997
- [Title 8 Index \(ca.gov\)](#)

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## California Repetitive Motion Injury Prevention standard

- Further lawsuits ensued
  - Late 1999, Appellate Court concluded "that, except for one conspicuous exemption [small employer exemption], the regulation [8 CCR Section 5110] is valid..."

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## OSHA - Ergonomics



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## Do you follow OSHA standards in China?

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# What does MEM stand for?

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# China regulations

- Ministry of Emergency Management
- Law of the People's Republic of China on Work Safety
- Law of the People's Republic of China on Occupational Diseases Prevention and Control

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# Ministry of Emergency Management

- Oversee the management of a wide range of natural and made-made disasters.

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### The Law of the People's Republic of China on Safe Production

- Rights and responsibilities of workers, employers and government agencies in creating and maintaining a safe workplace

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### The Law of the People's Republic of China on Safe Production

- Employees have the **right to stop any work they deem to be unsafe**. Employers may not cut the pay, benefits, or dismiss any worker who stops work for reasons of safety (Article 52).
- Workers **cannot be fired or retaliated** against for criticizing or reporting their employer for work safety concerns, or for refusing orders to perform unsafe work (Article 51).
- Employers must provide employees with **proper safety equipment** suitable to the nature of their work, and keep that equipment up-to-date and in working order (Articles 32, 33).
- Employers must also **provide safety training**, and not allow any worker who has not had proper training to work on the job site (Article 25).

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### The Law of the People's Republic of China on Safe Production

- Employers must purchase **work-related injury insurance** for all employees (Article 48).
- The **trade union may monitor workplace safety conditions**, raise suggestions, and participate in the investigation into workplace accidents (Article 57).
- Workers have the **right to participate in the management of work safety** through the trade union. When a company changes its work safety guidelines it should take into account the suggestions of the trade union (Article 5).
- Journalists have the **right to report on violations of workplace safety** for the purposes of educating the public (Article 74).

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Law of the People's Republic of China  
on Occupational Diseases Prevention  
and Control

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- Amend the second paragraph of Article 2 to say:  
"Occupational diseases referred to in this Law  
refer to diseases caused by exposure to dust,  
radioactive substances and other toxic and  
harmful factors in the professional activities of  
workers employed by enterprises, institutions and  
individual economic organizations." "

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Law of the People's Republic of China  
on Occupational Diseases Prevention  
and Control

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- Article 3 shall be amended to: "The prevention  
and treatment of occupational diseases shall  
adhere to the principle of prevention-oriented and  
combined prevention and control, establish a  
mechanism for the responsibility of employers,  
supervision by administrative organs, self-  
discipline of the industry, participation of workers  
and social supervision, and implement  
classification management and comprehensive  
governance." "

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Law of the People's Republic of China  
on Occupational Diseases Prevention  
and Control

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- Article 7 shall be changed to Article 8 and amended  
to read: "The State encourages and supports the  
development, development, promotion and  
application of new technologies, new processes, new  
equipment and new materials conducive to the  
prevention and treatment of occupational diseases  
and the protection of the health of workers,  
strengthens basic research on the mechanism and  
occurrence of occupational diseases, and improves  
the level of science and technology for the prevention  
and treatment of occupational diseases;

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## Conclusion

- The study of the relationship between people, work and the physical environment
  - OSHA
  - China government

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## To do list

1. Team Project: Submit team members.  
(5 students per team)
1. Read Ch 2 before the next class

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