



### Course File Check List

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## Revised-Academic Calendar of EVEN semesters of UG Programmes for 2020-2021

Semesters EVENTS	IV semester B.E./B.Tech.	IV semester B.Arch./ B.Plan.	VI semester B.E./B.Tech.	VI semester B.Plan./B.Arch	VIII semester B.E./B.Tech.	VIII semester B.Plan.	VIII semester B.Arch
	Commencement of EVEN Semester	19.04.2021	19.04.2021	19.04.2021	19.04.2021	19.04.2021	19.04.2021
Last Working day of EVEN Semester	07.08.2021	07.08.2021	07.08.2021	07.08.2021	#20.07.2021	#20.07.2021	07.08.2021
Practical Examinations	09.08.2021 To 19.08.2021	09.08.2021 To 19.08.2021	09.08.2021 To 19.08.2021	---	---	---	---
	23.08.2021 To 09.09.2021	23.08.2021 To 09.09.2021	23.08.2021 To 09.09.2021	10.08.2021 To 31.08.2021	22.07.2021 To 30.07.2021	22.07.2021 To 30.07.2021	10.08.2021 To 17.08.2021
Internship	---	---	---	---	---	---	---
Internship Viva-Voce/ Project Viva-Voce	---	---	---	---	02.08.2021 To 06.08.2021	---	---
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Professional training / Organization study	---	---	---	---	---	---	---
Commencement of ODD Semester	13.09.2021	13.09.2021	13.09.2021	13.09.2021	---	---	23.08.2021

• The classroom sessions for even the semester should commence from the dates mentioned above.

• The Institute needs to function for six days a week with additional hours (Saturday is a full working day). #if required the college can plan to have extra classes even on Sundays also.

• If any of the above dates are declared to be a holiday then the corresponding event will come into effect on the next working day.

• Notification regarding the Calendar of Events relating to the conduct of University Examinations will be issued by the Registrar (Evaluation) from time to time.

• The faculty/staff shall be available to undertake any work assigned by the university.

• Academic Calendar may be modified based on guidelines/directions issued in the future by MHRD/UGC/AICTE/State Government.

• Revised Academic Calendar is also applicable for Autonomous Colleges. In case if any changes are to be affected by Autonomous Colleges in the academic terms and examination schedule, they could do so with the approval of the University.

21.04.2021  
REGISTRAR



**Bapuji Institute of Engineering and Technology, Davanagere**  
**CALENDAR OF EVENTS-EVEN SEMESTER: APRIL 2021-SEP 2021 (Tentative)**

PARTICULARS	IV SEM BE/B.Tech	VI SEM BE/B.Tech	VIII SEM BE/B.Tech
Commencement of even sem	19-04-2021	19-04-2021	19-04-2021
Last Working Day	31-05-2021	07-08-2021	20-07-2021
1st Test Series	05-06-2021 To 01-07-2021	31-05-2021 To 05-06-2021 01-07-2021	24-05-2021 To 19-05-2021 21-06-2021 To 26-06-2021
2nd Test Series	01-07-2021 To 31-07-2021	07-07-2021 To 31-07-2021	13-07-2021 To 19-07-2021
3rd Test Series	05-08-2021 To 09-08-2021	05-08-2021 To 09-08-2021	---
Practical Examination	13-08-2021 To 23-08-2021	19-08-2021 To 27-08-2021	22-07-2021 To 30-07-2021
Theory Examination	05-09-2021	05-09-2021	02-08-2021 To 06-08-2021
University Viva-Voce	13-05-2021	13-09-2021	---
Commencement of odd semester	---	---	---

Forum activities:	Dept. of EEE	Dept. of Mech. Engrg.
Dept. of E&C	Dept. of EEE	Dept. of Mech. Engrg.
Dept. of Chemical Engrg.	Online Impulse 26-5-2021	Mech-I-Priz State Level Paper Presentation Competition 25-05-2021
Interdepartmental Sports 25-05-2021	5 Day online Webinar on Operational Planning in Power System, 10-14 May 2021	---
Anthralachand 29-05-2021	---	---
CHEMEXCEL-2021 04-05-2021	---	---
Industrial Visit 05-06-2021	---	---
Guest Lecture 28-06-2021	---	---

Principal



## **Vision of BIET**

To be a center of excellence recognized nationally and internationally, in distinctive areas of engineering education and research, based on a culture of innovation and invention.

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## **Mission of BIET**

BIET contributes to the growth and development of its students by imparting a broad based engineering education and empowering them to be successful in their chosen field by inculcating in them positive approach, leadership qualities and ethical values

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### **VISION OF THE DEPARTMENT**

To train the students to become Civil Engineers with leadership qualities, having ability to take up professional assignments and research with a focus on innovative approaches to cater to the needs of the society.

### **MISSION OF THE DEPARTMENT**

1. To provide quality education through updated curriculum and conducive teaching learning environment for the students to excel in higher studies, competitive examinations and professional career.
2. To impart soft skills, leadership qualities and professional ethics among the graduates to handle the projects independently with confidence.
3. To deal with the contemporary issues and to cater to the socio-economic needs.
4. To build industry-institute interaction and to establish good rapport with alumni.

### **PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

**PEO 1: Core Competence:** Graduates will be able to plan, analyse, design and construct sustainable Civil Engineering Infrastructure.

**PEO 2: Professional Skills:** Graduates will be professional engineers with a sense of ethics, creativity, leadership, self-confidence and independent thinking to cater to the needs of the society.

**PEO 3: Societal Needs:** Graduates will be able to contribute effectively for the development of industry and professional bodies.

**PEO 4: Cognitive Intelligence:** Graduates will be able to take up competitive examinations, higher studies and involve in research and entrepreneurship activities.

### **PROGRAM SPECIFIC OUTCOMES (PSOs)**

**Students after the completion of the Program will be able to**

1. Apply the fundamental concepts, software and codal provisions in the analysis, design and construction of sustainable civil engineering infrastructure.
2. Inculcate professional and leadership qualities, sense of ethics and confidence related to civil engineering.

**Faculty will be able to**

3. Contribute to the overall development of civil engineering community through the professional bodies and offer services to the society.
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Name of the Faculty: Smt. Sumana Y B

Time / Day	8 - 9	9 - 10	10.30 - 11.30	11.30 - 12.30	2 - 3	3 - 4	4 - 5
Mon	18CV653			18CV46 - A	18CVL67 - A2 (SYB+AGV)		
Tue		18CV653					
Wed			18CV653	18CVL67 - T (A)	18CVL67 - A1 (GBP+SYB)		
Thu		18CV46 - A			18CVL67 - B2 (SYB+SZH)		
Fri							
Sat	18CV46 - A						

1. 

Time Table Coordinator

  
Principal

TITLE OF THE COURSE: OCCUPATIONAL HEALTH AND SAFETY			
B.E., VI Semester, Civil Engineering			
[As per Choice Based Credit System (CBCS) scheme]			
Course Code	18CV653	CIE Marks	40
Number of Lecture Hours/Week	03	SEE Marks	60
Total Number of Lecture Hours	40 (8 Hours per Module)	Exam Hours	03
<b>Credits - 03</b>			
<b>Course Objectives:</b> This course will enable students to			
<ol style="list-style-type: none"> <li>1. Gain an historical, economic, and organizational perspective of occupational safety and health;</li> <li>2. Investigate current occupational safety and health problems and solutions.</li> <li>3. Identify the forces that influence occupational safety and health.</li> <li>4. Demonstrate the knowledge and skills needed to identify workplace problems and safe work practice</li> </ol>			
<b>Module-1</b>			
Occupational Hazard and Control Principles: Safety, History and development, National Safety Policy, Occupational safety and Health Act (OSHA), Occupational Health and Safety administration - Laws governing OSHA and right to know, Accident - causation, investigation, investigation plan, Methods of acquiring accident facts, Supervisory role in accident investigation			
<b>L1,L2,L3</b>			
<b>Module-2</b>			
Ergonomics at Work Place: Ergonomics Task analysis, Preventing Ergonomic Hazards, Work space Envelops, Visual Ergonomics, Ergonomic Standards, Ergonomic Programs, Hazard cognition and Analysis, Human Error Analysis - Fault Tree Analysis - Emergency Response - Decision for action - purpose and considerations			
<b>L2,L3,L4,L5</b>			
<b>Module-3</b>			
Fire Prevention and Protection: Fire Triangle, Fire Development and its severity, Effect of Enclosures, early detection of Fire, Classification of fire and Fire Extinguishers, Electrical Safety, Product Safety, Technical Requirements of Product safety,			
<b>L2,L3,L4,L5</b>			
<b>Module-4</b>			
Health Considerations at Work Place: types of diseases and their spread, Health Emergency, Personal Protective Equipment (PPE) - types and advantages, effects of exposure and treatment for engineering industries, municipal solid waste, Environment management plans (EMP) for safety and sustainability			
<b>L2,L3,L4,L5</b>			
<b>Module-5</b>			
Occupational Health and Safety Considerations: Water and wastewater treatment			

plants, Handling of chemical and safety measures in water and wastewater treatment plants and labs, Construction material manufacturing industries like cement plants, RMC Plants, precast plants and construction sites, Policies, roles and responsibilities of workers, managers and supervisors

**L3,L4,L5,L6**

**Course outcomes:** After studying this course, students will be able to:

1. Identify hazards in the workplace that pose a danger or threat to their safety or health, or that of others.
2. Control unsafe or unhealthy hazards and propose methods to eliminate the hazard.
3. Present a coherent analysis of a potential safety or health hazard both verbally and in writing, citing the occupational Health and Safety Regulations as well as supported legislation.



**Module-5**

Occupational Health and Safety Considerations: Water and wastewater treatment

plants, Handling of chemical and safety measures in water and wastewater treatment plants and labs, Construction material manufacturing industries like cement plants, RMC Plants, precast plants and construction sites, Policies, roles and responsibilities of workers, managers and supervisors

**L3,L4,L5,L6**

**Course outcomes:** After studying this course, students will be able to:

1. Identify hazards in the workplace that pose a danger or threat to their safety or health, or that of others.
2. Control unsafe or unhealthy hazards and propose methods to eliminate the hazard.
3. Present a coherent analysis of a potential safety or health hazard both verbally and in writing, citing the occupational Health and Safety Regulations as well as supported legislation.
4. Discuss the role of health and safety in the workplace pertaining to the responsibilities of workers, managers, supervisors.
5. Identify the decisions required to maintain protection of the environment, workplace as well as personal health and safety.

**Text Books:**

1. Goetsch D.L., (1999), "Occupational Safety and Health for Technologists, Engineers and Managers", Prentice Hall.
2. Heinrich H.W., (2007), "Industrial Accident Prevention - A Scientific Approach", McGraw-Hill Book Company National Safety Council and Associate (Data) Publishers Pvt. Ltd., (1991).
3. "Industrial Safety and Pollution Control Handbook

**Reference Books:**

1. Colling D.A., (1990), "Industrial Safety Management and Technology", Prentice Hall, New Delhi.
2. Della D.E., and Giustina, (1996), "Safety and Environmental Management", Van Nostrand Reinhold International Thomson Publishing Inc.

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**TITLE OF THE COURSE: SUSTAINABILITY CONCEPTS IN ENGINEERING**  
**B.E., V Semester, Civil Engineering**  
**[As per Choice Based Credit System (CBCS) scheme]**

Class : VI IS

Subject Code : 18CV653

Subject : Occupational Health & Safety

Total No. of Classes :

Sl No.	USN	NAME	DATE	19/04/21		20/04/21		21/04/21		22/04/21		23/04/21		24/04/21		No. of Days Present	%	Test Marks			Average	Remarks
				1	2	1	2	1	2	1	2	1	2	1	2			1	2	3		
01	4BD17IS051	NAYANA KS		00	01	02	03	04	05	06	07	08	09	10		23	30	19	27	10	37	
02	4BD18IS009	ANKITHA RM		00	00	01	02	03	04	05	06	07	08	09		28	29	27	28	10	38	
03	4BD18IS021	BHARAVI N SARODE		00	01	02	03	04	05	06	07	08	09	10		27	28	24	27	10	37	
04	4BD18IS092	SOUJANYA T		00	01	02	03	04	05	06	07	08	09	10		30	29	20	27	10	37	
05	4BD18IS097	SUPRIYHA M		00	01	02	03	04	05	06	07	08	09	10		30	29	20	27	10	37	
06	4BD18IS106	NARSHITHA SG		01	02	03	04	05	06	07	08	09	10	11		30	29	20	27	10	37	
07	4BD18IS111	VISHAL S MEHARWADE		00	01	02	03	04	05	06	07	08	09	10		30	29	20	27	10	37	
08	4BD19IS400	ADARSH MV		01	02	03	04	05	06	07	08	09	10	11		30	29	20	27	10	37	
09	4BD19IS401	AKHILA BC		00	01	02	03	04	05	06	07	08	09	10		30	29	20	27	10	37	
10	4BD19IS402	ALIYA SULTANA IMAM		00	01	02	03	04	05	06	07	08	09	10		30	29	20	27	10	37	
11	4BD19IS404	ESHWARA DEGINAL B		00	01	02	03	04	05	06	07	08	09	10		30	29	20	27	10	37	
12	4BD19IS405	MANOJ V CHIGATERI		00	00	00	00	00	01	02	03	04	05	06	07	27	29	20	27	10	37	
13	4BD19IS407	RAKSHITHA JAIN S		00	01	02	03	04	05	06	07	08	09	10		27	29	20	27	10	37	
14	4BD19IS408	SINCHANA HM		00	00	01	02	03	04	05	06	07	08	09		30	29	20	27	10	37	
15	4BD19IS409	VINAY PM		00	00	00	01	02	03	04	05	06	07	08		27	27	26	27	10	37	

Initials of Teacher

Initials of Student

Class :

Subject Code :

Subject :

Total No. of Classes :

Sl No.	USN	NAME	DATE	No. of Days Present	%	Test Marks			Average	Remarks
						I	II	III		
			28/06/21							
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Class: JEE

Subject Code: 18CV653

Subject: O.C. Computational Health & Safety

Total No. of Classes: 10

Sl No.	USN	NAME	DATE	No. of Days Present	%	Test Marks			Average	Remarks
						I	II	III		
01	ABD18EE001	ABHIGUNA S	01/02/03	04/05/06/07/08/09/10	30	29	30	10	40	
02	ABD18EE003	AFNAW AHAMED A B	00/00/01/02/03/04/05/06/07/08/09	10	27	27	23	10	33	
03	ABD18EE011	GNANESHVAR K K	00/00/01/02/03/04/05/06/07/08/09	10	30	29	25	10	35	
04	ABD18EE032	ROHITHKUMAR K	00/01/02/03/04/05/06/07/08/09/10	11	29	28	29	10	34	
05	ABD18EE039	SATHVIK S M	00/01/02/03/04/05/06/07/08/09/10	11	27	27	23	10	33	
06	ABD18EE042	SUNANDINI R GHALE	01/02/03/04/05/06/07/08/09/10/11	12	29	29	24	10	39	
07	ABD18EE050	VISHWANATHA R	00/01/02/03/04/05/06/07/08/09/10	11	29	29	28	10	38	
08	ABD18EE053	SAMIKSHA M VERNEKAR	01/02/03/04/05/06/07/08/09/10/11	12	27	27	28	10	38	
09	ABD19EE047	MANJUNATHA L	00/00/01/02/03/04/05/06/07/08/09	09	29	29	29	10	39	
10	ABD19EE044	SUHAS B V	00/01/02/03/04/05/06/07/08/09/10	10	25	24	24	10	34	
11	ABD17EE053	V N BALAJI	00/00/01/02/03/04/05/06/07/08/09	10	27	26	20	10	30	
12	ABD18EE012	GONTHAM BHARADWAJ	00/00/01/02/03/04/05/06/07/08/09	10	26	26	20	10	30	
13	ABD19EE042	BHARATH RAJ B R	01/02/03/04/05/06/07/08/09/10	11	28	28	22	10	32	
14	ABD19EE046	KUSHAL R GORAWAR	00/01/02/03/04/05/06/07/08/09/10	11	27	28	22	10	32	
15	ABD17EE025	MONIKA D	00/00/01/02/03/04/05/06/07/08	08	27	18	15	10	30	

Initial of Teacher: [Signature]

0 10 20 30 40 50 60 70 80 90 100





Class : VI CS

Subject Code : 18CV653

Subject : Occupational Health & Safety

Total No. of Classes :

Sl No.	USN	NAME	DATE	Test Marks					Average	Remarks							
				1	2	3	4	5									
01	ABD16CS035	KAMSAJI SINCHAN	00/01/22	03	04	05	06	07	08	09	10	28	29	17	25	10	35
02	ABD17CS011	ANJALI B	01/02/22	03	04	05	06	07	08	09	10	27	28	19	25	10	35
03	ABD17CS123	SAKSHI C JAIN	01/02/22	03	04	05	06	07	08	09	10	27	27	26	27	10	37
04	ABD18CS003	ATYAJ K	00/01/22	02	03	04	05	06	07	08	09	27	28	26	27	10	37
05	ABD18CS005	AMULYA H G	00/01/22	02	03	04	05	06	07	08	09	27	28	26	27	10	37
06	ABD18CS007	ANUSHA N M	01/02/22	03	04	05	06	07	08	09	10	27	28	27	27	10	37
07	ABD18CS009	ANUSHA TP	01/02/22	03	04	05	06	07	08	09	10	27	28	26	27	10	37
08	ABD18CS011	ARPI THA PM	01/02/22	03	04	05	06	07	08	09	10	27	28	27	27	10	37
09	ABD18CS019	DANIEL K R	01/02/22	03	04	05	06	07	08	09	10	27	28	27	27	10	37
10	ABD18CS021	DIVYA G	01/02/22	03	04	05	06	07	08	09	10	27	28	27	27	10	37
11	ABD18CS028	GAAGANDEEP B	00/00/22	01	02	03	04	05	06	07	08	27	29	29	29	10	39
12	ABD18CS025	GOUTHAM N M	01/02/22	03	04	05	06	07	08	09	10	27	29	27	28	10	38
13	ABD18CS029	JANZAMAM HA	01/02/22	03	04	05	06	07	08	09	10	27	29	27	28	10	37
14	ABD18CS039	MADHURA S R	01/02/22	03	04	05	06	07	08	09	10	27	27	27	27	10	37
15	ABD18CS045	MEGHAMALA C	01/02/22	03	04	05	06	07	08	09	10	27	28	27	28	10	38
16	ABD18CS047	MEGHANA M N	01/02/22	03	04	05	06	07	08	09	10	27	29	27	28	10	38
17	ABD18CS053	NEHA N	01/02/22	03	04	05	06	07	08	09	10	27	28	28	27	10	37
18	ABD18CS063	PRERANA PRAKASH LATTI	01/02/22	03	04	05	06	07	08	09	10	27	28	27	27	10	37
19	ABD18CS065	RAKSHANDA B	00/01/22	02	03	04	05	06	07	08	09	27	29	24	28	10	38
20	ABD18CS071	ROHIT N HIREMATH	00/01/22	02	03	04	05	06	07	08	09	27	28	25	27	10	37
21	ABD18CS073	SAHANA A E	00/01/22	03	04	05	06	07	08	09	10	27	27	24	28	10	36
22	ABD18CS075	SAHANAJ B	01/02/22	03	04	05	06	07	08	09	10	27	27	24	26	10	36
23	ABD18CS077	SAKSHI J PRAMOD	01/02/22	03	04	05	06	07	08	09	10	27	28	25	27	10	37
24	ABD18CS081	SANTAJ K S	01/02/22	03	04	05	06	07	08	09	10	27	27	28	27	10	37
25	ABD18CS085	SHASHANK S	00/01/22	02	03	04	05	06	07	08	09	27	27	28	27	10	36
26	ABD18CS087	SHIVA SAJI AJAY VARMA	00/00/22	01	02	03	04	05	06	07	08	26	27	27	27	10	30
27	ABD18CS091	SHREYA B	00/01/22	02	03	04	05	06	07	08	09	27	28	28	28	10	38
28	ABD18CS095	SNEHA G R	00/01/22	02	03	04	05	06	07	08	09	27	28	26	27	10	37
29	ABD18CS101	SRI RAKSHANA S	01/02/22	03	04	05	06	07	08	09	10	27	28	15	23	10	33
30	ABD18CS105	SUJAN G	00/00/22	01	02	03	04	05	06	07	08	27	27	27	27	10	37
31	ABD18CS111	SWATHI C S	01/02/22	03	04	05	06	07	08	09	10	27	29	29	29	10	39

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Class :

Subject Code :

Subject :

Total No. of Classes :

Sl No.	USN	NAME	DATE	No. of Days Present	Test Marks			Average	Remarks
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LESSON PLAN

Subject: Occupational Health & Safety	Subject Code: 18CV653	Class: V1			
Period	Date	Topics Planned	Date	Topics Covered	Remarks
1	14/04/21	Occupational Hazard and control principles safety	14/04/21	Occupational Hazard and control principles	
2	20/04/21	History and development National safety	20/04/21	History and development National safety policy	
3	26/04/21	Occupational safety and health act (OSHA)	26/04/21	Occupational Safety and health act (OSHA)	
4	27/04/21	Occupational health and safety admini- stration	27/04/21	Occupational Health & safety administration	
5	28/04/21	Laws governing OSHA and right to know	28/04/21	Laws governing OSHA and right to know	
6	03/05/21	Accident - causation, investigation	03/05/21	Accident - causation, investigation	
7	04/05/21	Investigation plan, method of acquiring accident facts	04/05/21	Investigation plan, method of acquiring accident facts	
8	05/05/21	Supervisory role in accident investigation	05/05/21	Supervisory role in accident investigation	
9	10/05/21	Ergonomics at work place: Ergonomics task analysis	10/05/21	Ergonomics at work place: Ergonomics task analysis	
10	11/05/21	Preventing ergonomic hazards	11/05/21	Preventing ergonomic hazards	
11	12/05/21	Work space envelope, visual ergonomics	12/05/21	Work space envelope, visual ergonomics	
12	17/05/21	Ergonomic Standards, Ergonomic programs	17/05/21	Ergonomic Standards, Ergonomic programs	
13	18/05/21	Hazard cognition and Analysis	18/05/21	Hazard cognition and Analysis	
14	19/05/21	Human Error Analysis - Fault tree analysis	19/05/21	Human Error analysis - Fault tree analysis	
15	24/05/21	Emergency response - Decision relations	24/05/21	Emergency response - Decision for action	
16	25/05/21	Purpose and con- siderations	25/05/21	Purpose and consider ations	

Subject: Occupational Health & Safety	Subject Code: 18CV653	Class: V1			
Period	Date	Topics Planned	Date	Topics Covered	Remarks
18	01/06/21	Fire triangle, fire development, fire severity	01/06/21	Fire triangle, fire development, fire severity	
19	07/06/21	Effect of enclosure, early detection of fire	07/06/21	Effect of enclosure, early detection of fire	
20	08/06/21	Classification of fire and fire extinguishers	08/06/21	Classification of fire and fire extinguishers	
21	08/06/21	Electrical safety	08/06/21	Electrical safety	
22	01/06/21	Product safety	01/06/21	Product safety	
23	14/06/21	Technical require- ments of product safety	14/06/21	Technical require- ment of product safety	
24	15/06/21	Health considerations at work place	15/06/21	Health consideration at work place	
25	16/06/21	Types of diseases and their spread	16/06/21	Types of diseases & their spread	
26	21/06/21	Health emergency	21/06/21	Health emergency	
27	22/06/21	Personal protective Equipment (PPE)	22/06/21	Personal protective equipment (PPE)	
28	23/06/21	PPE - Types and advantages	23/06/21	PPE - Types and advantages	
29	28/06/21	Effects of exposure and health hazard for chemical industry	28/06/21	Effects of exposure & health hazard for chemical industry	
30	27/06/21	Municipal solid waste	27/06/21	Municipal Solid waste	
31	30/06/21	Environmental management plans (EMP)	30/06/21	Environmental management plans (EMP)	
32	05/07/21	EMP for safety and sustainability	05/07/21	EMP for safety and sustainability	
33	06/07/21	Occupational Health and safety consideration	06/07/21	Occupational Health and safety consideration	

LESSON PLAN

Subject :

Subject Code :

Class :

Period	Date	Topics Planned	Date	Topics Covered	Remarks
35	17/10/21	Handling of chemical and safety measures in water treatment plants	17/10/21	Handling of chemical & safety measures in water treatment plant	
36	17/10/21	Handling of chemical and safety measures in water treatment plants	17/10/21	Handling of chemical and safety measures in water treatment plants	
37	17/10/21	Construction material manufacturing	17/10/21	Construction material manufacturing	
38	17/10/21	Cement plants	17/10/21	Cement plants	
39	17/10/21	Rmc plants	17/10/21	Rmc plants	
40	17/10/21	Precast plants and construction sites	17/10/21	Precast plants and construction sites	
41	17/10/21	Policies, roles and responsibilities of managers and supervisors	17/10/21	Policies, roles and responsibilities of managers and supervisors	
42	17/10/21	Responsibilities of managers and supervisors	17/10/21	Responsibilities of managers and supervisors	

LESSON PLAN

Period	Date	Topics Planned	Date	Topics Covered	Remarks

Text Books :

1. Koetsch D. L. (1999), 'Occupational safety and health for Technologists'
2. Hindrich H. B. (2007), 'Industrial Accident Prevention - A Scientific Approach'

Reference Books :

1. Selig D. A. (1990), 'Industrial Safety management and Technology'
2. Della D. E. and Giustina, (1996), 'Safety and Environmental management'
3. ....
4. ....
5. ....

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## OCCUPATION SAFETY AND HEALTH ACT

This act was passed on December 29<sup>th</sup> 1970, and became effective in 1971. Earlier laws were in general, designed to provide compensation for occupational injuries and illness, the focus of OSH act was prevention.

The major goal of the act was to ensure, “so far as possible every working man and woman in the nation is safe and healthful working conditions and to preserve our human resource”.

Everyone involved with safety must be familiar with the impacts of OSH act and compliance procedures.

A number of ideas were proposed in the OSH act to achieve in its fundamental aim, the following have proved to be the most important.

- 1) Mandatory occupational safety and health standards.
- 2) Effective enforcement.
- 3) Uniform record keeping and reporting procedures.
- 4) Separate but dependent responsibilities and rights of employees with respect to achieve safe and healthful worker conditions.
- 5) The establishment of occupational safety and health administration (OSHA) and national institute OSH (NIOSH).

## OSH – Administration

### 1. OSH administration standards

The responsibility of employees to provide safe and healthful workplace is based primarily on the standards established by OSH administration, a responsibility given by OSH act. OSH administration standards have been categorized in several ways. The most distinction is between, “Safety standards” which are intended to protect against traumatic injury and “Health standards” which deals with toxic substance and long term health effects. Another distinction is based upon the scope of standards.

- i) “Horizontal standards” applied to a wide variety of operations in virtually all industries.
- ii) “Vertical standards” are developed for a specific type of employment such as construction or telecommunication.

Many OSH administration standards are “consensus standards which have been adopted from nationally recognized organization notably from “American national standard institute” (ANSI), the “National Fire Protection Association” (NFPA) and the “American Society of Mechanical Engineers” (ASME). Others have been issued through specific rule making procedures, the major steps of which are as follows:

1. OSH administration proceeds on the basis of its own information, petitions from interested parties and recommendation from other government agencies, recommendation from (NIOSH) form an important basis for OSH administration standards.
2. OSHA may establish an advisory committee to make recommendation for the development of standards; requirements are laid down for the composition of advisory committee and for the time periods within which it must act.
3. If OSHA decides that a standard should be issued, it must publish a proposed standard and give the public at least 30 days to comment in writing. If objection to the proposals are filed and public hearing is requested, then such a hearing must be held.
4. On the basis of entire record OSHA must either, promulgate the standard or determine that no standard is needed and must publish a statement outlining its action.
5. Certain prescribed time frames for most stages of rule making must be followed.

There are many types of standard, all of which involve in control. The goal of good standards should be to co-ordinate work on the same problems in order to generate routine solution which can guide those who face similar problems in the future. There are particular characteristics which apply to good standards.

- 1) It must suggest something which can be attained.
- 2) It should be economically feasible.
- 3) It should be meaning full and applicable to the situations in which it is to be used.
- 4) It should be understood by its users.
- 5) It should be consistent in its interpretation.
- 6) It should be both stable and maintainable.

## 2. OSHA ENFORCEMENT

The act enforced OSHA standards by allowing surprise work place inspections and if violations are found, citations could be issued and civil penalties proposed. These aspects of enforcement have been upheld by the courts.

## LAWS GOVERNING OSHA

The Factories Act, 1948, the Mines Act, 1952, The Dock Workers (Safety, Health & Welfare) Act, 1986 are some of the laws, which contain provisions regulating the health of workers in an establishment. Whereas the Employees State Insurance Act, 1948 and the Workmen's Compensation Act, 1923 are compensatory in nature.

### 1. Health Provisions under the Factories Act, 1948

The Factories Act, 1948 was enacted with the object of protecting workers from subjecting to unduly long hours of bodily strain or manual labor. It lays down that employees should work in



healthy and sanitary conditions so far as the manufacturing will allow and that precautions should be taken for their safety and for the prevention of accidents.

The Act defines a 'worker' as any person employed directly or through any agency (including a contractor), whether for remuneration or not in any manufacturing process or in any work incidental to or connected with the manufacturing process. It is required that work performed should be connected with the product which is produced in the manufacturing process.

Section 10 of the Act lays down that a State Government may appoint qualified medical practitioners as 'certifying surgeons' to discharge the following duties:

- a) Examination and certification of young persons and examination of persons engaged in 'hazardous occupation'.
- b) Exercising medical supervision where the substances used or new manufacturing processes adopted may result in a likelihood of injury to the workers.
- c) Exercising medical supervision in case of young persons to be employed in work likely to cause injury.

Chapter IX of the Act lays down in detail the provisions relating to the health, safety and welfare measures, namely, cleanliness, level of ventilation, diversion of dust and fumes, provision of artificial humidification, sanitation, fencing of machinery, among others. There are also provisions that prohibit women and children from working in certain occupations.

27 processes and operations have been identified as dangerous in The Maharashtra Factories Rules, 1963. These Rules lay down detailed instructions regarding preventive measures, protective devices, cautionary notices as well as medical examination of workers. The State Governments have adopted these rules depending on their local needs. The Act lists 29 occupational diseases and obliges the manager of a factory and medical practitioners to notify the Chief Inspector of Factories if any worker contracts any of the diseases. The Rules are very comprehensive in laying down special provisions with respect to health, safety and welfare of workers including medical examinations, setting up of Occupational Health Centers, etc. The only lapse has been its ineffective implementation since most of the discretionary powers lie in the hands of the Inspectors and occupiers. Although very few cases of occupational diseases are reported in factories, the working conditions in most of the factories handling hazardous chemicals have higher risk potential.

## 2. The Employees' State Insurance (ESI) Act, 1948

It is a social security legislation enacted with the object of ameliorating various risks and contingencies sustained by workers while serving in a factory or establishment.

It is designed to provide cash benefit in the case of sickness, maternity and employment injury, payment in the form of pension to the dependents of workers who died of employment injury and medical benefit to workers. It recognizes the contributory principle against such contingencies, provides protection against sickness, replaces lumpsum payments by pension in the case of dependents benefit and places the liability for claims on a statutory organization.

The Act does not cover 'seasonal employments'. It defines 'employment injury' as personal injury to employees, caused by accident or occupational diseases, in an insurable employment.

The Act lays down provisions to set up an ESI Corporation, to promote measures to improve health and welfare of insured persons and a Medical Benefit Council to advise the Corporation on medical benefits, certification, etc. The Medical Boards have to ascertain the percentage of disability of injured workers before submitting their report to the Corporation in order to grant compensation to the workers. An injured worker has to wait for months before the Medical Board calls him for a check-up.

The main source of revenue for the ESI Fund is the Contribution paid by the employers and the employees. The purposes for which the Fund is to be used are numerous. It includes payment of benefits, provision of medical treatment to insured families, meet charges in connection with medical treatment, maintenance of hospitals, dispensaries, etc. In existing conditions there is gross misuse of these funds.

The discretionary powers with respect to using the Fund amount lie solely with the Corporation along with the State Governments. According to the Occupational Health and Safety Center, Mumbai, the Corporation has only 4 occupational disease centers for workers.

Section 39 of the Act makes the employer primarily liable for the payment of contribution on behalf of himself and his employees towards the ESI Fund.

In case of misuse of the contribution by employer, the employee can sue the employer in the Employees' State Insurance Court set up by the respective State Government.

Where an employee makes a claim on the grounds of sickness, disablement or maternity, it has to be made against the ESI Corporation and not against the employer. The process involved to obtain the compensation, is tedious. Such a lapse renders the very object of the Act to provide for quick claims as unreal.

Under the Workmen's Compensation Act, 1923, there exists a legal obligation on the employer to pay compensation to workmen involved in accidents arising during the course of their employment. The prerequisites for payment of compensation to such workmen are as follows:

- Personal injury must be caused.
- There must be temporary, total or partial disablement due to an accident, which also includes occupational diseases.

The State Government is to appoint a Commissioner to decide the liability of an employer to pay compensation, the amount and duration of compensation, among other issues. An appeal may lie to the High Court in case the applicant is grieved with the Commissioner's orders.

Compensation is decided on the nature of injury caused. Where the injury from an accident results in the death of the workman, the minimum compensation payable is around Rs 50, 000 and the maximum may extend to Rs 3, 00,000. In case of permanent total disablement and permanent partial disablement, compensation may extend to Rs 60, 0000, depending on its nature. Further the amount of compensation is calculated on the wage-group to which the workman belongs and the time-period for which he has worked.

## ERGONOMICS

Ergonomics is defined as the science of confirming (fit or be suitable) the work place and all its elements to the worker. The word 'Ergonomics' is derived from the Greek word 'Ergon' means to work and 'Nomos' means laws or studies. Therefore, ergonomics means "work laws". In practical it consists of the scientific principles applied in minimizing the physical stress associated with the work place.

### Benefits of Ergonomics

Some of the accepted benefits of ergonomics are:

- Improved health and safety for worker.
- Higher discipline or moral throughout the workplace.
- Improved quality.
- Improved productivity.
- Improved competitiveness.
- Fever, work place injuries and health problems.

## ERGONOMIC TASK ANALYSIS

Task analysis can be defined as the study of what an operator is required to do in terms of action or cognitive processes to achieve a system goal.

Specific ergonomic problems are identified by conducting a task analysis of the job. National safety council recommends one or more of the following approaches for conducting a task analysis.

### 1. GENERAL OBSERVATIONS

General observation of a worker or workers performing the task can be an effective technique for task analysis. The effectiveness is enhanced if the workers are not aware that they are being observed. While observing employees at work, especially attentive to task require manual material handling and repetitive movements.

### 2. QUESTIONNAIRES AND INTERVIEWS

This method can be used for identifying ergonomic problem. Questionnaires are easier to distribute, tabulate and analyse in short period of time but interviews generally provide more in depth information's.

### 3. VIDEOTAPING AND PHOTOGRAPHY

Videotaping technology has simplified the process of task analysis considerably. Videotaping records the work being observed as it is done; it is silent process so it is not intrusive. If photography is used be aware that photo flash can be disruptive. High speed film will allow making photographs without flash.

### 4. DRAWING AND SKETCHING

Making a neat sketch of a work station or a drawing showing work flow can help to identify problems. Before using a drawing or sketch make sure that it is accurate.



### 5. MEASURING THE WORK ENVIRONMENT

Measurements can help identifying specific ergonomic problem. How far must a worker carry the material, how much does an object weight, how high does a worker have to lift the object, how often is a given motion repetitive? Answer to these similar questions can enhance the effectiveness of analysis process.

### 6. UNDERSTANDING THE ERGONOMIC OF AGING

When identifying specific ergonomic problems in the work place a special challenges presented mainly by aging workers. Usually nearly 30% of the work force is 45 years of age or older. Organizations must be prepared to adopt work stations to employees whose physical needs are different from those of their younger ages. In adopting work stations and process for employees who are older, keep the following thumb rules in mind.

- Nerve conduction velocity, hand grip strength, muscle mass, range of motion and flexibility all begin to diminish about age 45.
- Weight and mass tend to increase through the age.
- Height begins to diminish beginning age around 30.
- Lower back pain is more common in people of 45 years age and older.
- Visual acuity at close range diminishes with age.

## ERGONOMIC PROGRAMS

Ergonomic programs are best performed by a professional ergonomist. The ergonomic team or any qualified person can use analysis program to conduct work site analysis and identify stressors in the work place. The work site analysis program is divided into four main categories.

### 1. Gathering information from available sources.

- **Records analysis and tracking**

The essential first step in the work site analysis is records analysis and tracking to develop the information necessary to identify ergonomic hazards at workplace. Existing medical, safety and insurance records should be analysed for the evidence of injuries and disorders associated with cumulative trauma disorders (CTD). Health care providers should participate in this process to track the patient records.

- **Incidence rate**

Incidence rate for upper extremity disorders, back injuries should be calculated by counting the incidence of CTD'S and reporting the number of each 100 full time workers per year by the facility. Incidence is calculated by using the following formula.

Incident rate = \_\_\_\_\_

2. Conducting baseline screening surveys to determine which job need closer analysis.

The second step in worksite analysis is to conduct baseline screening surveys identify jobs that put employees at risk of developing CTD'S

- **CHECKLIST**

The survey is performed with an ergonomic checklist. This check list should include components such as posture, materials handling and upper extremity factors.

- **ERGONOMOC RISK FACTORS**

It includes conditions of a job process work station or work method that contribute to the risk of developing CTD'S.

- **CTD RISK FACTOR**

1. Repetitive or prolonged activities
2. Forceful exertion
3. Prolonged static postures
4. Awkward postures of the upper body including reaching above the shoulders or behind the back and the twisting the wrist and other joints to perform task
5. Inappropriate / inadequate hand tools
6. Continued physical contact with work surface
7. Excessive vibrations from power tools
8. Cold temperatures

- **BACK DISSORDER RISK FACTOR**

Risk factor for back disorders include items such as the following

1. Bad body mechanics such as the following bending over at the waist, continued lifting from below the knees from above the shoulders and twisting at waist while lifting.
2. Lifting or moving objects of excessive weight.
3. Prolonged sitting especially with poor posture.
4. Lock of adjustable chairs footrests body supports in work surface at work stations.
5. Poor grips on handles.
6. Slippery foots.

3. Performing ergonomic job hazard analysis of those work station with identified risk factor and after implementing control measures.

The job hazard analysis should be routinely performed by a qualified person for jobs that put workers at risk of developing CTD'S. This type of analysis helps to verify risk factors at light duty of restricted activity and at work positions.

- **WORK STATION ANALYSIS**

An adequate work station analysis could be expected to identify all risk factors present in each studied job or work station. Tools should be checked for excessive vibration, the tools, PPE'S and dimensions and adjustability of the work station should be noted for each job hazard analysis.

- **LIFTING HAZARDS**

For manual material handling the maximum weight lifting values should be calculated.

- **VIDEOTAPE METHOD**

The use of video tape were feasible is suggested as a method for analysis of the work process. Slow motion video tape or equivalent visual records of workers performing their routine job tasks should be analysed to determine the demands of the task on the worker and how each worker actually performs each task.

4. Conducting periodic surveys by taking feed backs and follow up studies to evaluate changes. The 4<sup>th</sup> step in work site analysis is to conduct periodic preview. Periodic surveys should be conduct to identify previously unnoticed factors or failures or deficiencies in work practices or engineering controls. The periodic preview process should include feedback, follow up and trend analysis.

- **FEED BACK AND FOLLOW UP**

A reliable system should be provided for employees to notify management about conditions that appear to be hazardous and to utilize their insight and experience to determine work practice and engineering controls. This may be initiated by ergonomic questionnaire and maintained through an active and safety and health committee or by employee participation with the ergonomic team. Reports of ergonomic hazard or signs and symptoms of potential CTD'S should be investigated by screening surveys and ergonomic hazard analysis in order to identify risk factors.

- **TREND ANALYSIS**

Trends of injuries and illness related to actual or potential CTD'S should be calculated using several years of data, trends should be calculated for several departments and process units and work stations. These trends may be used to determine which work position are most hazardous and need to be analysed by the qualified person.

## **PREVENTING ERGONOMIC HAZARD**

There are many ways to reduce ergonomic risk factors and help fit the workplace to the worker. Solutions can be grouped into three main categories: eliminate the hazard, improve work policies and procedures, and provide personal protective equipment. Often the best solution involves a combination of approaches.

1. **ELIMINATE THE HAZARD**

The most effective way to control ergonomic hazards is to eliminate the risk factors altogether. Sometimes you can change the tools, equipment, job design, or work area to remove the hazard completely. This is called using "engineering controls."

These are some examples of engineering controls:

- Redesign workstations and work areas to eliminate reaching, bending, or other awkward postures.
- Provide adjustable tables and chairs that can be used by workers with a range of sizes and shapes, and that allow neutral postures.
- Provide carts for transporting material and mechanical hoists to eliminate lifting.



- Use tools that fit the hand, have no sharp edges, and eliminate awkward hand and wrist positions.
- Change where materials are stored to minimize reaching.
- Design containers with handles or cut-outs for easy gripping.

Improving the workplace is the heart of ergonomics: changing the work to fit the worker. The design should accommodate the wide range of people assigned to the task.

## **2. IMPROVE WORK POLICIES AND PROCEDURES**

The next most effective solution is to develop work policies, procedures, and practices that change how the job is done. This is called using “administrative controls.”

These are some examples of administrative controls:

- Rotate workers among different tasks to rest the various muscle groups of the body, reduce repetition, and ease mental demands.
- Improve work scheduling to minimize excessive overtime or shift work which can cause fatigue.
- Increase staffing to reduce individual workloads.
- Provide sufficient breaks, since adequate recovery time can reduce fatigue.
- Assign more staff to lifts of heavy objects.
- Encourage proper body mechanics and use of safe lifting techniques.
- Require all loads to be labelled with their weight.
- Store heavy objects at waist height.
- Follow good housekeeping practices. Keep floors free of slipping or tripping hazards. Maintain power tools properly to reduce vibration. Keep cutting and drilling tools sharp to reduce the force required.
- Provide workers with training on safe working postures, lifting techniques, ergonomics policies and procedures, and the safe use of lifting and carrying devices.

Training is a critical element of nearly any solution and provides an important opportunity for worker participation. However, it is not a substitute for reducing risk factors and should be used in combination with engineering and administrative controls.

## **3. PROVIDE PERSONAL PROTECTIVE EQUIPMENT**

While more permanent solutions are being found and implemented, or if you are unable to redesign the job or equipment to eliminate risks, personal protective equipment (PPE) can be used.

PPE that can help address ergonomic problems includes:

- Knee pads for kneeling tasks.
- Shoulder pads to cushion loads carried on the shoulder.
- Gloves to protect against cold, vibration, or rough surfaces.

## **4. ESTABLISH A COMPREHENSIVE ERGONOMICS PROGRAM**

Employers should establish an ergonomics program to minimize musculoskeletal disorders. Elements of a good program include:

- Management commitment.
- Worker involvement.

- An organizational structure to get the work done, such as an ergonomics team or committee.
- Training and education of workers and supervisors.
- Job evaluation to identify risk factors.
- Hazard prevention and reduction or elimination of risk factors.
- Early detection and treatment of ergonomic injuries, and medical management of injury cases.
- A system for workers and supervisors to report ergonomic problems, symptoms, and injuries without reprisal.
- On-going evaluation of the ergonomics program.

## WORK SPACE ENVELOPE

Workspace is the space within which you perform the tasks that add up to your job. Physical design of a workspace includes working out how much space needed, and positioning of furniture, tools, equipment and any other items needed to perform the tasks, in respect of posture, access, clearance, reach and vision of the user.

A poorly designed workspace, or a bad arrangement of furniture or equipment, may result in injuries and strains due to adoption of uncomfortable working postures, less 'spare' capacity to deal with unexpected events or emergencies, the increased possibility of errors or accidents, and inefficiency.

A 'workspace envelope' is a 3-dimensional space within which you carry out physical work activities when you are at a fixed location. The limits of the envelope are determined by your functional arm reach which, in turn, is influenced by the direction of reach and the nature of the task being performed. Most of the things that you need to use to carry out your tasks should be arranged within this area. Workspace envelopes should be designed for the 5th percentile of the user population, which means that 95% of users will be able to reach everything placed within the envelope.

## SEATED WORKSPACE

In general, the maximum work area is the area within comfortable reach of your extended arm, while the normal work area is within the limits of a comfortable sweeping movement of your arm, with your elbow bent at a right angle or less. You should also consider any potential restraint caused by clothing that you might have to wear, as well as personal factors such as age, gender (women have greater flexibility than men), and any disabilities.

The type of task being performed also affects the boundary of the workspace envelope. For tasks that require the activation of a switch, it is common to use anthropometric measurements from the fingertip reach of the users to set the envelope boundary. However, where a grasping action is involved, the reach of the user is reduced as your fist has to be clenched.

Some general principles for seated work:

- Working with relaxed upper arms and elbows at approximately 90° provides comfort and helps maintain straight wrists, which reduces the strain of repetitive tasks.
- Adjustable height work surfaces allow each user to fit the work surface to their own needs. If this is not possible, fix the work surface height to be at a level that places the working item, for example, a keyboard, at elbow height.
- Make sure that there is adequate clearance for your thighs under the work surface.
- Small users whose feet do not touch the floor when seated should have a footrest.
- For fine work, requiring better visibility, the work surface can be raised, but elbow support must be provided.

### STANDING WORKSPACE

The limit of the workspace envelope for a standing user can be seen as the space in which an object can be reached and gripped comfortably, when you are standing up straight. Your arms and hands are most powerful when your elbows are close to your sides and bent at right angles or more, that is, extended slightly. The work surface should allow this kind of posture for manual work requiring strength. For precise, fine work, as well as for writing, drawing and reading, the work surface should be higher so that the elbows can be rested on it. This will also bring the work closer to your eyes.

Some general principles for standing work:

- For work that requires the application of force from the shoulder and back muscles, the work surface should be about 100-250mm lower than the level of the elbows.
- For normal tasks that do not require much strength, the worktop should be about elbow height or just below.
- For precision work, the work surface should be about 50-100mm above elbow height.
- Precision work should preferably be done sitting, when the back muscles should be supported and relieved by suitable seating and elbow support. The provision of high stools allows users to alternate between a standing and a 'perched' position.
- Adjustable height work surfaces allow each user to fit the work surface to their own needs. If this is not possible, design for the largest user, and supply platforms to those that are smaller.

### VISUAL ERGONOMICS

Visual ergonomics is the multidisciplinary science concerned with understanding human visual processes and the interactions between humans and other elements of a system.

Guidelines for monitor placement and lighting at work place:

- Eye-to-screen distance: Locate the monitor at least 25 inches from the eyes, preferably more.



- Vertical location: Locate the entire viewing area of the monitor between  $15^\circ$  and  $50^\circ$  below horizontal eye level.
- Monitor tilt: Tilt the monitor back so that the top is slightly farther away from the eyes than the bottom.
- Lighting: Ceiling suspended indirect lighting. Control outside light with blinds and shades. Keep ambient light levels low and supplement with task lighting.
- Screen colours: Dark letters on a light background.

Fig 1 shows Visual Ergonomics in the Office and Fig 2 shows Horizontal line of sight and preferred viewing area.

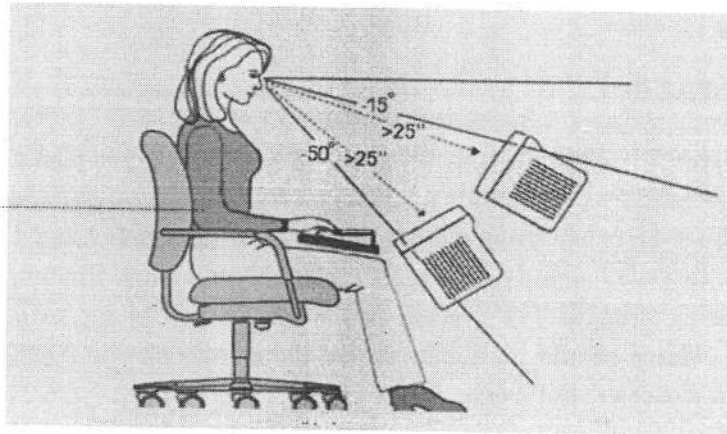


Fig 1: Visual Ergonomics in the Office

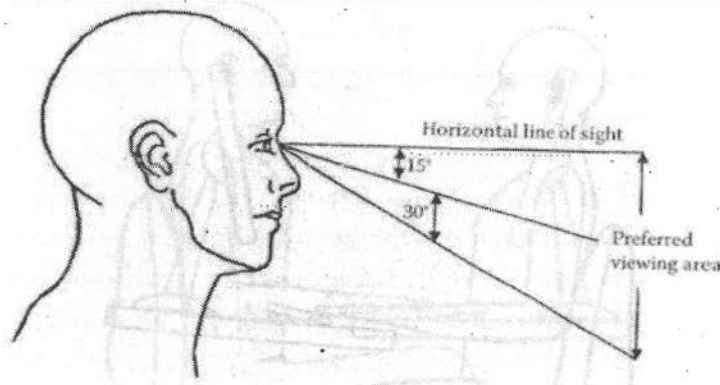


Fig 2: Horizontal line of sight and preferred viewing area.

## HAZARD COGNITION AND ANALYSIS

Hazard can be defined as a work place condition which exists or can be caused in combinations with other variables, which has the potential for accidents, serious injuries, diseases or property damage.

Cognition is the mental action or process of acquiring knowledge and understanding through thought, experience and the sense.

**FIRE**

Technical explanation for fire is naturally occurring energy release in the form of heat and light when oxygen combines with a combustible or burnable material at a suitable high temperature. Three things must be present at the same time in order to produce fire.

- i. Enough oxygen to sustain combustion.
- ii. Enough heat to raise the material to its ignition temperature.
- iii. Some sort of fuel or combustible material.

Fire or combustion is a chemical reaction between Oxygen and combustible fuel. It is a process by which fire converts fuel & Oxygen in to energy usually in the form of heat, by products of combustion includes light and smoke. For the reaction to start a source of ignition such as a spark or open flame or a sufficiently high temperature is needed.

Fire is a chain reaction, for combustion to continue these must be a constant source of fuel, Oxygen & heat which are in intimate contact with each other. This is explained by the fire triangle.

Fig: Fire Triangle



All chemical reaction involve forming and breaking of chemical bonds between atoms. In the process of combustion materials are broken down into basic elements, loose atoms forms bonds with each other to create molecules of substances that were not originally present. Therefore during burning deadly fumes are generated due to melting of plastics or synthetic polymers.

Remove the fires access to fuel or remove the Oxygen & fire dies. Although a spark may start a fire but the heat produced during fire is necessary to sustain it. Therefore, a fire may be put out by removing the fuel source starting it of Oxygen or cooling it below the combustion point. Even in Oxygen rich environment, fire can be avoided by controlling heat and breaking the bond between three elements of fire which is shown below in figure by broken triangle.

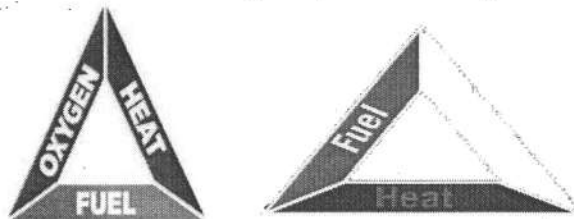


Fig: Broken Triangle.

**CLASSES OR TYPES OF FIRE**

There are six different types of fire classes which are based on the energy source that has caused them. Classifying a fire according to its energy source also makes it easier to choose the most appropriate method of fighting the fire. The classes of fire are as follows:

**Class A – Ordinary combustible fires**

Materials involved in these types of fires include paper, wood, textiles, rubber, some plastics and other organic carbon-based compounds.

Class A fires can be extinguished using appliances and fire extinguishers that spray water. The water cools the fire, removing the heat supply which is essential for the fire to burn.

**Class B – Flammable liquids**

Examples of liquids that are flammable include petrol, kerosene, alcohol, solvents and paints. Fires involving these volatile chemicals burn at a very high temperature give lots of heat and often spread quickly. These fires also produce toxic smoke and fumes, which can make situations involving these types of risks very difficult to control.

**Class C – Flammable gases**

Commercial premises used to store flammable gases such as butane, propane and petroleum gases can be very dangerous. Even a single spark has the potential to create an explosion consequently there are many laws to ensure flammable gases are stored securely in sealed containers and many insurers insist on having additional gas detection systems installed to provide an early sign of gas leakage.

Fires involving flammable gases are one of the hardest fires to put out as it can be hard to isolate the source of leakage and stop the release of gas or flammable liquid.

**Class D – Metal fires**

It requires a lot of heat to ignite most metals, but metals are good conductors and transfer heat away quickly to their surroundings so can be the cause of a fire. Powdered metals and metal shavings are easier to ignite than solid lumps of metal and therefore a much higher fire risk.

Standard fire extinguishers will not put out a class D fire and, if used on this type of risk, will almost certainly make the situation worse.

**Class E – Electrical fires**

Electrical fires can be caused by faulty equipment, damaged wiring, short circuits, and overloaded switchboards and sockets. Although electrical fires are not strictly a fire class of their own, electricity is classed as a source of ignition and has its own special fire safety requirements. You should never try to extinguish a fire caused by electricity using water or foam as this acts as a conduit and could electrocute the person holding the appliance.

**Class F – Cooking oil fires**

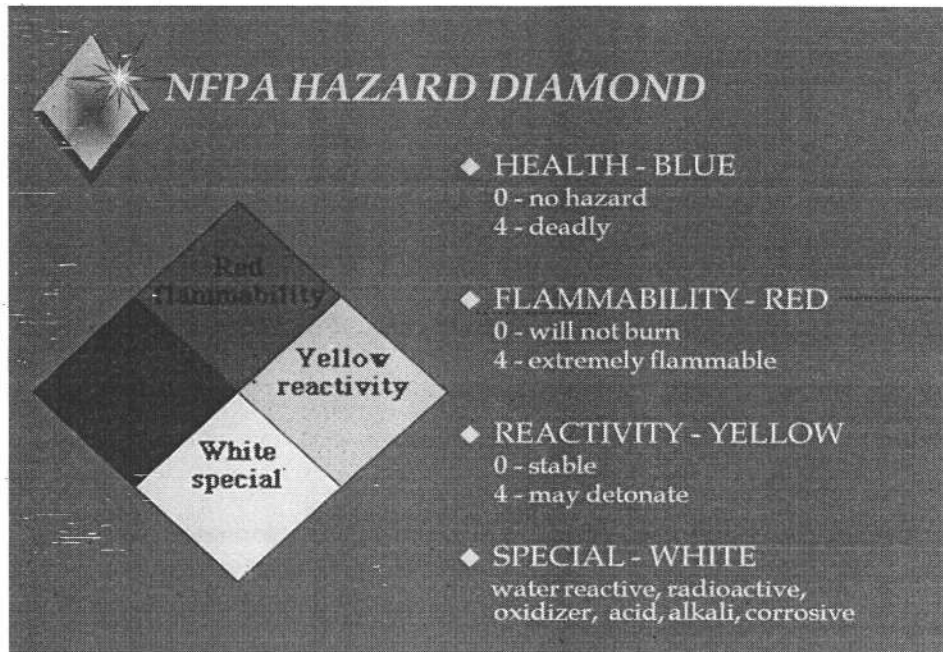
Class F fires involve cooking oil and fats. These ignite at very high temperatures making them difficult to extinguish.

Standard fire extinguishers will not put out a class F fire and, if used on this type of risk, will almost certainly make the situation worse.



**IDENTIFICATION OF FIRE**

The national fire protection association (NFPA) has devised a system NFPA 704 for the quick identification of hazards presented when substances work, NFPA'S Red, Blue, Yellow & White diamond is used on the product labels & shipping cartons rating within each category are 0-4, where 0 represents no hazard, 4 represents most sever hazard.

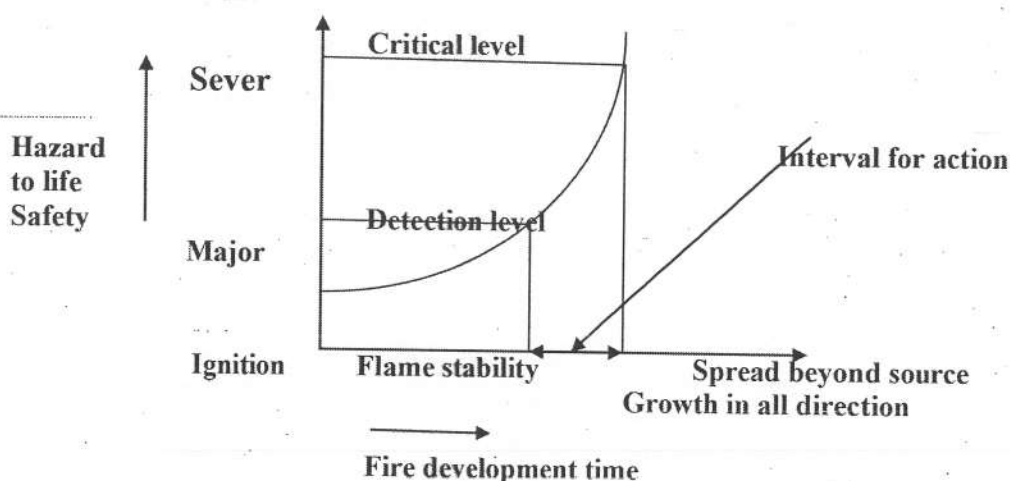


**Fig: NFPA Hazard Diamond**

1. Flammability has a red background & is the top quarter (1/4) of the diamond
  - 0 means no hazard; materials are stable during fires which do not react with water
  - 1- Slight hazard, flash point well above normal ambient temperature.
  - 2- Moderate hazard, Flash point well above normal ambient temperature.
  - 3- Extreme Fire hazard, Gases or liquids can ignite at normal temperature..
  - 4- Extremely hazard flammable gases or liquids with very low flash point.
2. Health has a blue background & is the left quarter (1/4) of the diamond.
  - 0- No threat to health
  - 1- Slight health hazard respirator may be recommended.
  - 2- Moderate health hazard, respirator & high protection is required.
  - 3- Extremely dangerous to health, protective clothing's, Equipments is required.
  - 4- Eminent danger to health, Breathing or skin absorption may cause death. A fully encapsulating sooth is required.
3. Reactivity has a yellow background & the right Quarter of the diamond.
  - 0- No hazard
  - 1- Slight hazard material can become unstable at high temperature or react with water.

- 2- Moderate hazard material may undergo violent reaction that will not explode.
  - 3- Extreme hazard material may explode if an ignition source is given/ violently react with water.
  - 4- Constant extreme hazard materials may undergo other hazardous reaction on their own.
4. Special information has a white background & is the bottom quarter of the diamond. This area is used to note any special hazard presented by the material.

**FIRE DEVELOPMENT: SEVERITY & DURATION**



**Fig:** General Effects of Fire Development on Hazards to Life Safety

The protection of life is of primary importance in fire situation & therefore aware of the hazards & its development, fire developed over time & the environment detritions as smoke & heat build up to endanger life.

Initially, when fuel, Oxygen and heat combine there is little or no hazard when ignition occur, fires develops slowly & the rate of hazard increases as the fire develops.

The figure shows the general effect of fire development on hazards to life safety; from the figure we can say that there is a time interval between the first detection & the critical level of fire development which represents hazards to life cycle. All actions to preserve life safety must be undertaken in this interval to time.

**Ignition:** The ignition source along with the fuel first ignited will determine the initial fire development, the ignition source dependent on the fuel & presence of flammable vapors in the right mixtures.

**Flames spread:** Flame spreads along the surface of the original fuel which was ignited depends on the properties of the fuel & the supply of Oxygen. The moving flame heats adjacent un-burnt fuel, adding more flammable vapors & increasing the flame sites. In general flame spreads faster upwards than reduce little horizontally or downward due to heating by the combustion products flowing upwards & outwards from the fire

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### THE EFFECTS OF ENCLOSURE

Once the fire is been started it spread beyond the source is determined by the enclosure within the building. In larger fire, the effect of enclosure will become a important factor as it controls the Oxygen source and it traps all combustion gases in the upper portion of the room. This is a result of heat transfer under fire conditions. Heat must be transferred to other materials for the fire to spread and takes place by convection, conduction or radiation.

Convection is the movement of heat by hot gases, conduction the transfer of heat through a material from hot to cold area and radiation is transfer of heat by electromagnetic waves from a source to a solid within line of site with the source.

When a fire is contained within a room where Oxygen supply is adequate, the fire will continue to grow until all the fuel is consumed, such a fire which is limited by amount of fuel is called fuel controlled fire. When all fuel is burning, but is slowed because it becomes starved of Oxygen then it is called ventilation controlled fire.

### EARLY DETECTION OF FIRE

Life safety is the major concern in fire protection. From various examinations it is clear that life safety through early detection is the best way.

Detection permits fires to be extinguished easily and results in less damage to property. There are many types of detection system, these systems can warm off the pressure of smoke, radiation, elevated temp or increased light intensity.

The Four important fire detection systems are as follows:

**1. Thermal expansion detector**

Use a heat sensitive metal link that melts at a predetermined temperature that make contact and ultimately sound an alarm or heat sensitive instrument can be used which will melt in a predetermined temperature there by initiating short circuit and activating the alarm:

**2. Photo electric fire sensors**

It detects changes in infrared energy that is radiated by smoke, often by the smoke particles obscuring the photo electric beam. A relay is open under acceptable conditions and closed to complete the alarm circuit when smoke interferes.

**3. Radiation or ionization sensors**

It losses the tendency of a radioactive substance to ionize when exposed to smoke. The substance becomes electrically conductive with smoke exposures and permits the alarm circuit to be completed.

#### 4. UV or infrared detectors

It sounds an alarm when the radiation from fire flames is detected. When rapid changes in radiation intensity and gives alarm signal.

### REDUCING FIRE HAZARD

The best way to reduce fire is to prevent their occurrence.

- ❖ One means of reducing fire hazard is the isolation of triangle elements of fire.
- ❖ Fire may also be prevented by the proper storage of flammable liquids. Liquids should be stored in flame resistant buildings that are isolated from places where people work or in tanks below ground level or on the first floor of multi storage building.
- ❖ Substituting less flammable materials is another effective technique for fire reduction.
- ❖ A catalyst or fire inhibitors are employed to create an endothermic energy that will smother the fire.
- ❖ Several ignition sources can be eliminated or isolated from fuels. Smoking should be prohibited near any possible fuels; electrical spark from equipments, wiring and lighting should not be close to fuel, open flames should be kept separate from fuels, use of non sparking equipments has to be encouraged.
- ❖ Other strategies for reducing the risk of fires are as follows:
  - Clean up spills of flammable liquids as soon as they occur and properly dispose of the materials used in the clean up.
  - Keep work areas free from extra supplies of flammable materials, place electrical cords along wall rather than across.
  - Turn off the power and completely de-energize the equipment before conducting maintenance procedures.
  - Routine the test fire extinguishers.

### FIRE EXTINGUISHERS

A fire extinguisher is an active fire protection device used to extinguish or control small fires, often in emergency situations. It is not intended for use on an out-of-control fire, such as one which has reached the ceiling, endangers the user (i.e., no escape route, smoke, explosion hazard, etc.), or otherwise requires the expertise of a fire department. Typically, a fire extinguisher consists of a hand-held cylindrical pressure vessel containing an agent which can be discharged to extinguish a fire.

The types of extinguishing agents how they function and how they can be distributed are summarized in below table.



**Table:** Types of extinguishing agents with mechanism and method of distribution for different class of fire

Extinguishing agents	Types of fire used for	Mechanism for extinguishment	Method of distribution	Problems encountered
Water	A, B, D	Cooling (heat absorbed in vaporization) smothering, emulsification, dilution	Automatic sprinklers, hose system	Freezing and pipe bursts in unheated areas
Carbon-di-oxide	C, A, B, D	Smothering, cooling	Portable extinguishers, total flooding	Re-ignition after dissipation
Halogenated agents (HALONS)	C, A, B, D	Chain breaking (chemical reaction which interferes with combustion)	Automatic sprinklers, Portable extinguishers	Toxic
Dry chemicals	A, B, C	Chain breaking, Smothering, cooling, radiation shielding	Automatic sprinklers, Portable extinguishers	
Foams	A, B, D	Smothering	Portable extinguishers, hose system	Horizontal fires only
Combustible metal agents	D	Smothering, cooling	Spread by hand Portable extinguishers	Expensive

**TYPES OF FIRE EXTINGUISHERS**

To deal with the multitude of different fire classes, a range of fire extinguishers have been developed. Types of fire extinguishers are as follows:

1. Water type fire extinguisher.
2. Foam type fire extinguisher.
3. Dry chemicals type fire extinguisher.
4. Carbon-di-oxide type fire extinguisher.
5. Halon type fire extinguisher.

## 1. WATER TYPE FIRE EXTINGUISHER

Water expelling fire extinguishers have water as an extinguishing agent which is released in the form of a jet by means of gas pressure in the upper part of the container. The gas pressure may be induced by chemical reaction or by mechanical means. Water expelling fire extinguishers is as shown in figure, are used mainly in Class 'A' fire, water when applied to burning material is converted to steam which reduces the percentage of available oxygen. Water expelling type extinguishers should not be used on fires involving electrical equipment without de-energizing them.

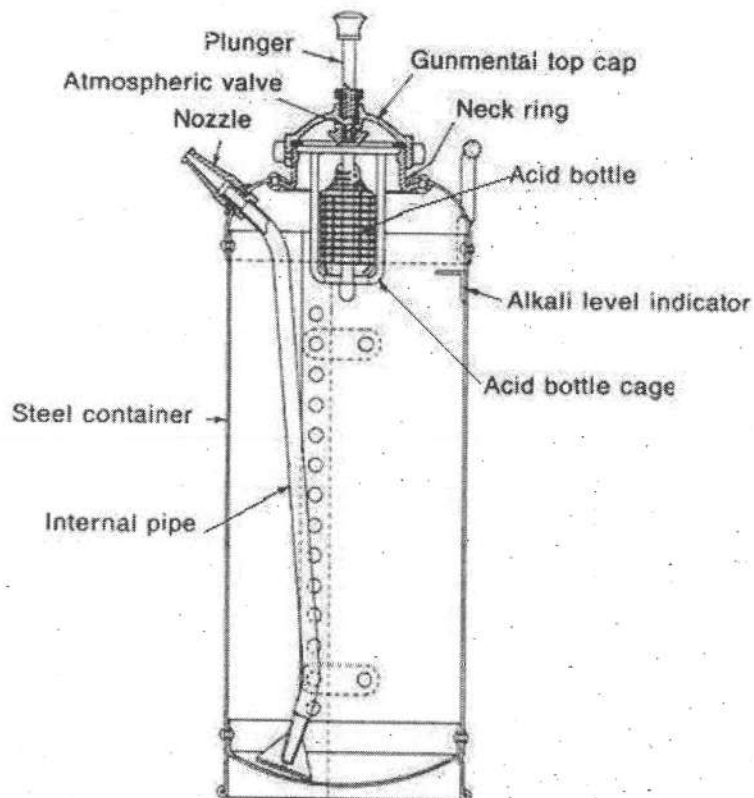


Fig: Water Type Fire Extinguisher

The various types of water expelling extinguishers are:

- i. Soda acid type.
- ii. Gas pressure activated type.
- iii. Constant air pressure type.

## INTRODUCTION

Workplace Health and Safety (WHS) often referred to as Occupational Health and Safety (OH&S) involves the assessment and migration of risks that may impact the health, safety or welfare of those in workplace. This may include the health and safety of customers, employees, visitors, contractors, volunteers and suppliers.

Creating a safe work environment is a legal requirement and critical to the long term success. It can:

- Help to retain staff.
- Maximise employee productivity.
- Minimise injury and illness in the workplace.
- Reduce the costs of injury and workers' compensation.
- Ensure you meet your legal obligations and employee responsibilities.

## Types of Diseases and their Spread at Work Place

An infectious disease sometimes referred to as "contagious" or "communicable," spreads from person to person by various routes and is caused by pathogens (i.e., germs or "bugs"). Preventing the spread of infectious diseases requires basic infection-control procedures, including appropriate hand washing technique, personal hygiene and keeping the workplace clean. Educating employees on these basic practices and other information on transmission and common prevention measures can have a huge impact on your ability to control infectious diseases in the workplace.

Employees can be exposed to communicable diseases at work, home, recreational facilities, health clubs and while traveling. Business travel, and in particular global travel, can increase workers potential exposure to infections, if they are not immunized properly. Multiple exposures may occur as these travellers return to the workplace, possibly exposing associates to communicable diseases. Contractors and temporary agency workers can expose on-site employees to various communicable diseases, too.

Various types of communicable diseases at work place may spread thorough airborne and contact.

### Airborne Diseases

TB (Tuberculosis), SARS (Severe Acute Respiratory Syndrome), Meningitis, Chickenpox, Measles, Smallpox, Influenza (flu), etc. are transmitted primarily from airborne droplets from an infected person's cough, sneeze, or spit, which can then be inhaled by others.

### Contact Diseases

Hepatitis A virus (HAV), Dysentery, Salmonellosis, E. Coli, Typhoid Fever and Methicillin - Resistant Staphylococcus Aureus (MRSA) are spread primarily by person-to-person contact, generally from an infected person's feces, urine, nasal discharge or infected

skin, directly or indirectly from contaminated food, drinking water, someone else's hands or objects. These diseases are spread more easily where there are poor sanitary conditions or poor personal hygiene is practiced.

## **Best practices for preventing infectious disease**

Best practices for preventing infectious disease exposure include the following:

- Written policies and procedures for infection control.
- Employee screening, vaccination, and education.
- Communication and follow up with the physician regarding the employee's clearance to work.
- Absence Management program that allows sending a sick employee home, encouraging the employee to stay at home while feeling ill, and seeking medical attention.
- Good housekeeping including cleaning/disinfecting contaminated work areas with an EPA- approved detergent/disinfectant.
- Properly managing an occupational exposure.

These prevention techniques should minimize your workers' compensation and liability exposures. Aside from these prevention techniques, effective controls include early recognition of symptoms, prompt diagnosis and adequate isolation or treatment.

## **HEALTH EMERGENCY**

Workplaces need a plan for health emergencies that can have a wider impact. Quick and effective action may help to ease the situation and reduce the consequences. However, in emergencies people are more likely to respond reliably if they:

- Are well trained and competent.
- Take part in regular and realistic practice.
- Have clearly agreed, recorded and rehearsed plans, actions and responsibilities.

The type of medical emergency-determines how quickly response team personnel must react. OSHA medical and first aid standard 29 CFR 1910.151 says that for a life-threatening emergency such as cardiac arrest, choking or profuse bleeding, on-site life support services must begin within the first three to four minutes and continue until professional help arrives. With a non-life-threatening emergency, teams must provide first aid services within 15 minutes. Emergency response teams should receive first aid and cardio pulmonary resuscitation training. If you have older employees or any with known heart conditions, it's a good idea to purchase and provide automated external defibrillator training.

Regardless of the type of emergency, medical procedures focus on three basic steps, which the American Red Cross identifies as Check-Call-Care. The first step is to secure the scene and check the injured person. For example, you might turn off malfunctioning machinery, find and turn off the source of a gas leak or secure items that appear ready to fall. Next, check



the injured person. Starting at the person's head, look for any cuts, bleeding or bruises. Feel his forehead for temperature, check his skin colour and note whether the person is sweating. Check the limbs and torso for injuries and listen for signals of pain. Watch for changes in consciousness and look for signs of breathing trouble. If the situation is serious or life-threatening, the next step is to call emergency number. Then, begin providing emergency life-support and/or first aid services.

Treat non-life-threatening injuries such as minor cuts or burns with common first aid procedures. For example, cover open wounds with a sterile dressing and apply direct pressure to control or stop the bleeding. Treat minor burns with cold running water and a loose, sterile dressing. For serious emergencies, such as choking, response teams should know how and when to administer back-blows and perform the Heimlich maneuver, which a series of abdominal thrusts is. CPR is a combination of chest compressions and rescue breaths that help oxygenate and keep blood circulating to vital organs. When giving CPR, the standard is to repeat a cycle of 30 compressions and two rescue breaths until help arrives or defibrillation begins.

## PERSONAL PROTECTIVE EQUIPMENT

Under the various provisions of the factory act and rules the management of any factory has to their employees the required personal protective equipment. The safety equipment's are to be used in any working industry. It may be inconvenient initially, but one should get used to it, here we have to remember the personal protective equipment's are only substituting in preventing injuries, or bad health, if the hazards of the work place cannot be controlled by engineering method or administrative control, The appliance are the last line of defence against any hazard, and they are only a barrier between person and the hazard. If the barrier fails or turns in effective due to one reason or other, the person using the equipment's will be a victim, Hence the following are the requirement's to be remembered while selecting the equipment's:

- Adequate protection against the hazards to which the worker will be exposed.
- Maximum comfort and minimum weight.
- No restriction of essential movements.
- Durability and susceptibility of maintenance at the premises, where it is used.
- Construction in accordance with the accepted standards of performance and material.
- Attractive looking.

Personal protective equipment's may be divided into two based groups:

1. Non respiratory
2. Respiratory

### 1. NON RESPIRATORY

The common safety appliances are:

1. Helmet

2. Face shield
3. Goggles
4. Hand gloves
5. Ear plug/ muff
6. Aprons (leather asbestos PVC etc.,)
7. Safety boots
8. Leg guard and
9. Partisan covers etc.

All personal protective equipment provided to the workers as required under the act shall have Indian standard bureau.

The factory inspectorate having regard to the nature of the hazards involved in work and process carried out, order the occupier or the manager in writing to the supply to the workers exposed to particular hazard any personal protective equipment as may be found necessary.

The various type of personal protective equipment's is detailed here under.

## **Head Protection**

When workers are employed in areas where there is danger of falling objects they shall wear safety helmets.

## **Eye Protection**

Suitable goggles are to be worn by all workers engaged in the following processes:

- The cutting out or cutting off of cold rivets, bolts from boilers or other plant.
- Chipping, sealing or scurfing of boilers or ship plates.
- Drilling by means of portable machine tools.
- Dry grinding of metals.
- Cutting and welding.
- Handling of chemicals injuries to eyes.

## **Hand Protection**

Adequate protection for the hands shall be available for all workers when using cutting or welding apparatus or when engaged in machine cutting or machine riveting or in transporting or stacking plates or in handling plates at machines or in handling chemicals.

## **Protection in Connection With Cutting or Welding**

Suitable goggles fitted with tinted cyc pieces shall be provided and maintained for all persons employed when using cutting or welding apparatus and also when engaged in the process of electric welding. Other appliance required when doing such works are helmets or head shields suitable hand shields to protect the eyes and face from hot metal and from rays

likely to be injurious. Suitable gauntlets to protect the hands and force arms hot metal and from rays likely to be injurious.

### **Safety Belts and Life Lines**

Whenever any worker is engaged on work at a place from which he is liable to fall more than 2m. He shall be provided with safety belts equipped with life lines which are secured with a minimum of slack, to a fixed structure unless any other effective means such as provision of grand rails or ropes are taken to prevent his falling.

All safety belts and life line shall be examined once in six months by a competent person to ensure that no belt or life line which is not in good condition is used.

The provision of clean, uncontaminated air to workers should be accomplished by suitable engineering technique. However, this is not possible under all circumstances notably during shutdown, plant emergencies or non- routing work- and suitable respiratory devices must, in these cases, be worn by workers.

## **2. RESPIRATORY PROTECTIVE DEVICES**

Respiratory protective devices are based on two main principles:

1. Decontamination of local air by filtration, absorption etc., using respirators.
2. Segregate external supply using "breathing apparatus" breathing apparatus.  
Breathing apparatus may be subdivided into the following classes:
  - a) Short distance fresh air breathing apparatus.
  - b) Compressed air line breathing apparatus.
  - c) Self- contained breathing apparatus.

The selection of equipment used will depend upon the type of operation and the nature and concentration of the contaminants.

Obyiously an external breathing supply is essential in an oxygen deficient atmosphere therefore breathing apparatus should be specified whenever oxygen level are below 20% volume. Even perfect respiratory protection may not always prevent contaminants entering the body and a relatively large number of substances will penetrate unbroken skin on liquid or vapour contact.

Since respiratory protection depends upon the proper use of the equipment (particularly under emergency conditions) all prospective user must be carefully trained in its use.

In a breathing apparatus the overall efficiency depends largely on the face piece seal which is affected by the shape and size of the wearer's features e.g. whether smooth shaven or whether spectacles are worn. For the letter, in some locations, regular users of breathing apparatus are issued with a special type of spectacles with flexible flat side-pieces or templar to help obtained a satisfactory seal. Numerous design of face piece e.g. full or half are available of which the Baxter and pneu-seal safe piece fitted with an inflatable pneumatic peripheral seal and the double face piece type are probably the most recent developments.

Entry into confined spaces and atmospheres immediately hazardous to life, by personnel wearing respiratory protection, should not be permitted unless the wearer is equipped with a rescue harness with a life-line either attached or available and similarly equipped personnel are standing by keeping observation.

## **EFFECT OF EXPOSURE TO MSW**

Municipal solid waste include commercial and domestic waste generated in municipal or notified areas or in either solid or semisolid form excluding industrial hazardous waste but including treated Bio-medical wastes.

Problems faced due to solid wastes handling and disposal are; workers and other persons who manually collect and process Solid waste regularly are especially at high risks. Workers are exposed to a multitude of health hazards that result from direct handling and contact with (wastes) workers will be experiencing health hazards in 3 ways these are

- Accidents,
  - Infections and
  - Chronic diseases.
1. The first type of health impact is accidental injuries such as cuts and injuries from sharp object in the wastes, muscular and skeletal disorders resulting from the handling heavy containers. Intoxication and injuries resulting from contact with small amounts of hazardous chemical wastes collecting with garbage and burns and other injuries result with garbage and burns and other injuries resulting from accidental occupation at waste disposal site or from methane gas fires or explosions at landfill site.
  2. The second type of health impacts is infections caused by exposure to humans to Solid waste, or its products of decomposition. Blood borne infections such as tetanus resulting from injuries caused by infected sharp items in the waste are common. Ophthalmologic and dermatological infections from exposure to contaminated dust are also possible. Many tropical diseases transmitted by vectors such as mosquitoes have their origins in the breeding ponds created by indiscriminate wastes disposal garbage forms a source of food for rates, flies and various insects. Hence typhoid, plague, dysentery, epidemics would occur many also result in zoonosis which results from bite by wild or stray animals feeding on wastes.
  3. The third type of health impact is chronic disease causes by exposure to toxic chemicals. Incinerations operators are especially exposed to chronic respiratory diseases resulting from exposure to dust, to toxic and carcinogenic risks resulting from exposure to hazardous compounds, cardiovascular disorders and heat stress resulting from exposure to excessive temperature and to loss of hearing functions due to exposure to excessive noise.





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Assignment No.	3	Maximum Marks	10
Semester	VI	Scheme	CBCS – 18
Course Co-ordinator	Sumana Y.B		
<b>Course Outcome Statements :</b> After the successful completion of the course, the students will be able to			
CO1	Explain the safety principles, right –to-know laws and manage situation applying theories of accident at workplace		
CO2	Explain the ergonomics with appropriate strategies		
CO3	Explain fire and electrical safety issues		
CO4	Explain Personal Protective Equipment (PPE)		
CO5	Explain occupational diseases		
CO6	Explain work place safety in construction industry and water and waste water treatment plants.		

**Note : Answer all the questions.**

Q. No.	Question	Marks	RBT Level	CO
1	Explain the occupational safety and health consideration of construction industry.	2.5	L2	6
2	Explain the occupational safety and health consideration of waste water treatment.	2.5	L2	6
3	Explain the occupational safety and health consideration of textile industry.	2.5	L2	6
4	Explain the occupational safety and health consideration of iron and steel industry.	2.5	L2	6

Last date for submission	06	07	2021
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**RBT (Revised Bloom's Taxonomy) Levels : Cognitive Domain**

L1 : Remembering	L2 : Understanding	L3 : Applying
L4 : Analysing	L5 : Evaluating	L6 : Creating

  
Course Coordinator  
(Faculty in charge)

ASSISTANT PROFESSOR  
Civil Engineering Depart  
B.I.E.T., Davangere

  
Coordinator  
DQAC

  
Program Coordinator  
(HOD, Civil)

**CBCS SCHEME**

USN

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15CV564

Fifth Semester B.E. Degree Examination, June/July 2019

**Occupational Health and Safety**

Time: 3 hrs.

Max. Marks: 80

**Note: Answer any FIVE full questions, choosing ONE full question from each module.****Module-1**

- 1 a. Outline the circumstances that led to development of OSHA and state the mission and purpose of OSHA. (09 Marks)  
 b. Discuss in detail the two important responsibility of employer according to OSHA. (07 Marks)

OR

- 2 a. Enumerate the axioms of Industrial Safety. (08 Marks)  
 b. Briefly explain the Dominos theory of accident causation. (08 Marks)

**Module-2**

- 3 a. Describe the OSHA's Ergonomic Guidelines. (10 Marks)  
 b. Brief out the NSC's Recommendations for conducting a Task Analysis. (06 Marks)

OR

- 4 a. Define "Hazard". Explain the FTA with an example. (10 Marks)  
 b. Discuss the various hazard deterrence methods. (06 Marks)

**Module-3**

- 5 a. Classify the types of fire and enumerate the early fire detection devices used. (06 Marks)  
 b. Name different types of fire extinguishers used and explain any two with sketches. (10 Marks)

OR

- 6 a. Describe the importance of Electrical Safety. (04 Marks)  
 b. Summarize the technical requirements of Product Safety Programme. (12 Marks)

**Module-4**

- 7 a. Write the classification of Repeated Strain Injury and types of disorder-associated with it. (06 Marks)  
 b. Suggest the measures adopted to control the risk of occupational health. (10 Marks)

OR

- 8 a. Explain the importance of PPE's at workplace. (06 Marks)  
 b. briefly discuss about the EMP for safety. (10 Marks)

**Module-5**

- 9 a. Explain the health and safety aspects to be considered in waste water treatment plants. (10 Marks)  
 b. Summarize the potential hazards posed for workers at construction sites. (06 Marks)

OR

- 10 a. Discuss the occupational health hazard posed in an epoxy manufacturing unit. (06 Marks)  
 b. Comment on the Roles and Responsibilities of workers and managers in Safety programs. (10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

## INTRODUCTION

In the early 1900 industrial accidents were common in most of the countries. For example, in 1907 over 3200 people were killed in mining activity in United States (US). During this period legislation president and public opinion all favored management. There was only little protection for workers safety. Then the people began national safety council in 1913 in Chicago, a board based organization with thousands of members from business industry, agriculture, education, labor and government. The development of safety movement in US has paralleled that of national safety council (NSC).

Working conditions for the industrial employees today have improved significantly. The chance of a worker being killed in an industrial accident is less than what it was in the earlier days. Improvements in safety until now have been the result of pressure for legislation to promote safety and health, steadily increasing cost associated with accidents and injuries and the professionalization of safety as an occupational.

## HISTORY OF OSHA

During industrial revolution, child labor in factories was common. The working hour were long, the hard work and the conditions often unhealthy and unsafe following an outbreak of fever among children working in cotton mills, the people of 'Manchester', England began demanding better working condition in the factories. Public pressure eventually forced a government response and in 1802 "the health and morals of apprentices act" was passed this was a mile stone piece of legislation. It marked the beginning of government involvement in work place safety.

Factory inspection was introduced in Massachusetter in 1867, In 1869 Pennsylvania legislation act passed on mine safety. The bureau of labor statistics (BLS) was established in 1869 to study industrial accident and report relative to inform about those accidents. In 1877 the first legislation requiring the use of guards for hazardous machinery was passed.

## DEVELOPMENT OF SAFETY PROGRAMS

The first recorded safety program began in response to 'Joliet plant' of Illinois steel company in 1892. A committee of plant executives was formed to evaluate the problem and their first action was to inspect and test all fly wheels in the plant. Gradually other high injury industries took similar action but, it was not until workman compensation laws became general that accident prevention programs received serious attention the national safety council (NSC, 1912) promotes safety through compilation and dissimilation of safety information and promotion of safety consciousness.

As industry became more aware of safety, methods to prevent accident were developed and engineer efforts to train and educate workers were undertaken and safety rules were established and enforced. Safety programs were built upon the principles of the "3 E's of safety"- Engineering, Education and Enforcement. The success of these traditional safeties depends on how we build upon.

Recommendation for changes safety programs intended to continue and improve upon the success, fall into 2 categories:

- 1) Federal legislation such as “occupation safety and health act”.
- 2) Improve safety methodology.

## **NATIONAL SAFETY POLICY**

The National Policy on Safety, Health and Environment at Work Place was declared by the Ministry of Labor and Employment, Government of India in February 2009 after consultations with partners. The Action Programme to implement the Policy is part of the document.

The National Policy, referring to the Constitution of India, sets out a set of goals with the view to building and maintaining a national preventative safety and health culture and improving the safety, health and environment at workplace. The Policy also expresses a set of the national objectives.

The outline for Action Programme identifies eight specific working areas, including enforcement, national standards, compliance, awareness; research and development, occupational safety and health skills development and data collection.

After an initial review to ascertain the status on safety, health and environment at workplace, the Policy is envisaged to be reviewed at least every five years.

## **BENEFITS**

The Policy is not limited to large and organized sector, but extends even to Medium scale and unorganized sectors.

The Policy Provides for

- General guidance to all the stakeholders to discharge their responsibilities in an appropriate manner.
- Helps to create a positive safety and health culture.
- Enables development of research activities, skill development of employees, employers, enforcement authorities, and society at large.
- Participation and cooperation of employers and employees promoting employee participation for effective management.
- Ensures better compliance and implementation through a mechanism of accrediting competent professionals and institutions.
- The implementation of the policy would enable timely collection, compilation, and analysis of work related injuries, diseases, sicknesses etc. for qualitative decision making at the national level.
- It provides for OSH systems approach to be followed by the management including use of computer aided risk assessment tools for dealing with safety, health and environment at workplace problems.





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USN										
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Course/Subject Title	Occupational Safety and Health	Course/Subject Code	18CV653
Semester	VI	Scheme	CBCS – 18
Date	11.06.2021	CIE No.	I
Time	10.30-11.30AM	Max. Marks	30


<b>Course Outcome Statements :</b> After the successful completion of the course, the students will be able to	
CO1	<b>Explain</b> the safety principles, right –to-know laws and manage situation applying theories of accident at workplace
CO2	<b>Explain</b> the ergonomics with appropriate strategies
CO3	<b>Explain</b> fire and electrical safety issues
CO4	<b>Explain</b> Personal Protective Equipment (PPE)
CO5	<b>Explain</b> occupational diseases
CO6	<b>Explain</b> work place safety in construction industry and water and waste water treatment plants.

<b>Note : Answer any one full question from each Part.</b>				
Q. No.	Question	Marks	RBT Level	CO
<b>Part A</b>				
1	<b>Outline</b> the circumstances that led to the development of OSHA and state the mission and purpose of OSHA.	10	L2	1
2	<b>Explain</b> briefly the Dominos theory of accident causation.	10	L2	1
<b>Part B</b>				
3	<b>a.Explain</b> the various methods of accident investigation.	10	L2	1
	<b>b. Explain</b> i) Human error analysis ii) Fault tree analysis	10	L2	2
4	<b>a.Discuss</b> in detail the two important responsibility of employer according to OSHA.	10	L1	1
	<b>b.Describe</b> OSHA's Ergonomic Guidelines.	10	L2	2

<b>RBT (Revised Bloom's Taxonomy) Levels : Cognitive Domain</b>		
L1 : Remembering	L2 : Understanding	L3 : Applying
L4 : Analysing	L5 : Evaluating	L6 : Creating

  
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(Faculty in charge)

  
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DQAC

  
Program Coordinator  
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USN

Course/Subject Title	Occupational Health and Safety	Course/Subject Code	18CV653
Semester	VI	Scheme	CBCS - 18
Date	08.07.2021	CIE No.	II
Time	10.30-11.30AM	Max. Marks	30

Course Outcome Statements : After the successful completion of the course, the students will be able to

CO1	Explain the safety principles, right-to-know laws and manage situation applying theories of accident at workplace
CO2	Explain the ergonomics with appropriate strategies
CO3	Explain fire and electrical safety issues
CO4	Explain Personal Protective Equipment (PPE)
CO5	Explain occupational diseases
CO6	Explain work place safety in construction industry and water and waste water treatment plants.

Note: Answer anyone full question from each Part.


Q. No.	Question	Marks	RBT Level	CO
<b>Part A</b>				
1	Explain the different stages of fire development and its severity	10	L2	3
2	List the classification of fires and explain it briefly	10	L1,L2	3
<b>Part B</b>				
3	a. Summarize the technical requirements of Product Safety Programme.	10	L2	3
	b. Briefly discuss about the EMP for safety and sustainability.	10	L2	4
4	a. Name different types of fire extinguishers used. Explain any one in detail.	10	L1,L2	4
	b. List the types of respiratory PPE and explain any 2 of them.	10	L2	3

**RBT (Revised Bloom's Taxonomy) Levels : Cognitive Domain**

L1 : Remembering	L2 : Understanding	L3 : Applying
L4 : Analysing	L5 : Evaluating	L6 : Creating

  
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Course/Subject Title	Occupational Health and Safety	Course/Subject Code	18CV653
Semester	VI	Scheme	CBCS – 18
Date	07.08.2021	CIE No.	III
Time	10.30-11.30AM	Max. Marks	30


<b>Course Outcome Statements :</b> After the successful completion of the course, the students will be able to	
CO1	<b>Explain</b> the safety principles, right –to-know laws and manage situation applying theories of accident at workplace
CO2	<b>Explain</b> the ergonomics with appropriate strategies
CO3	<b>Explain</b> fire and electrical safety issues
CO4	<b>Explain</b> Personal Protective Equipment (PPE)
CO5	<b>Explain</b> occupational diseases
CO6	<b>Explain</b> work place safety in construction industry and water and waste water treatment plants.

<b>Note: Answer any one full question from each Part.</b>				
Q. No.	Question	Marks	RBT Level	CO
<b>Part A</b>				
1	Classify Occupational diseases. <b>Explain</b> the causes, effects and preventive measures of any two of the diseases related to respiratory tract	10	L2	5
2	<b>Explain</b> any two of the Occupational dermatitis diseases.	10	L2	5
<b>Part B</b>				
3	a. <b>Explain</b> the cement manufacturing process	10	L2	6
	b. Briefly <b>explain</b> the potential hazards and its preventive actions in cement manufacturing plant	10	L2	6
4	a. <b>Explain</b> briefly the occupational health and safety considerations in RMC Plants	10	L2	6
	b. <b>Explain</b> briefly the occupational health and safety considerations in water treatment plants	10	L2	6

<b>RBT (Revised Bloom's Taxonomy) Levels : Cognitive Domain</b>		
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**Scheme of Valuation**

Course/Subject Title	Occupational Health & Safety	Course/Subject Code	18CV653
Semester	VI	CIE No.	I
Date	11.06.2021	Max. Marks	30

<u>part - A</u>		
01.	History of OSHA Mission and purpose of OSHA	05m 05m
02.	Listing the theories of accident causation Explanation of Domino's theory	02m 08m
<u>part - B</u>		
03.	a. Explanation of various method of accident investigation such as i) preserve / Document the scene ii) collect information iii) methods of acquiring facts iv) completing report & implement corrective actions	02m 08m
	b. Explanation of i) Human error analysis ii) Fault tree analysis	05m 05m
04.	a. Listing the responsibilities of employer <u>acc</u> to OSHA Explanation of two responsibilities	02m 08m
	b. Describing OSHA's ergonomic guidelines such as i) CTD risk factor ii) Back disorder risk factor iii) Lifting hazards iv) Work station analysis v) Trend analysis	02m 08m

*[Signature]*  
 Course Coordinator  
 (Faculty in charge)

*[Signature]*  
 Coordinator  
 DOAC

*[Signature]*  
 Program Coordinator  
 (HOD, Civil)




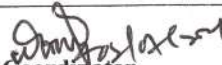


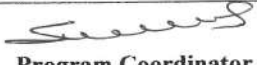
### Scheme of Valuation

Course/Subject Title	occupational health & safety	Course/Subject Code	18CV653
Semester	VI	CIE No.	II
Date	08.07.2021	Max. Marks	30

01.	<p style="text-align: center;"><u>part-A</u></p> Graphs of different stages of fire development Explanation of different stages of fire development	02m 08m
02.	Listing the classification of fires Explanation of classification of fires	02m 08m
03.	<p style="text-align: center;"><u>part-B</u></p> Listing the product safety programs	02m
a.	Explanation of product safety programs such as 1) Design review 2) Documentation & change control 3) purchase product control 4) manufacturing & quality control 5) packing & marketing	08m
b.	Listing the Environmental management plans Explanation of conceptualization, planning, execution, operations	02m 08m
04.	Listing out different kinds of fire extinguishers	02m
a.	Explanation of any one type in detail	08m
b.	Listing out different types of respiratory PPE's Explanation of any two types of respiratory PPE's	02m 08m

  
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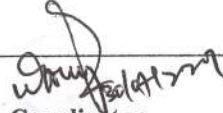
### Scheme of Valuation

Course/Subject Title	Occupational Health & Safety	Course/Subject Code	18CV653
Semester	VI	CIE No.	III
Date	07.08.2021	Max. Marks	30

<u>Part - A</u>		
1.	Classification of occupational diseases	02m
	Causes of occupational diseases	02m
	Effects	02m
	preventive measures	02m
	Explanation of any two respiratory diseases	02m
2.	Explanation of occupational dermatitis diseases	05m
	1) Contact dermatitis 2) Skin cancer	05m
	3) Airborne contact dermatitis 4) Allergic contact dermatitis	
<u>Part - B</u>		
3.		
a.	Explanation of cement manufacturing process	05m
	flowchart	05m
b.	Explanation of potential hazards of cement manufacturing plant	05m
	preventive actions	05m
4.		
a.	Listing out the occupational health & Safety considerations in RMC plant	05m
	Explanation	05m

  
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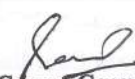
  
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DQAC

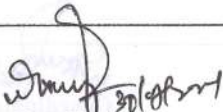
  
Program Coordinator  
(HOD, Civil)

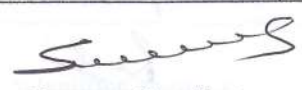


### Scheme of Valuation

b.	Lifting out the occupational safety & health considerations in water treatment plants Explanation	05m 05m
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Assignment No.	1	Maximum Marks	10
Semester	VI	Scheme	CBCS – 18
Course Co-ordinator	Sumana Y.B		
<b>Course Outcome Statements :</b> After the successful completion of the course, the students will be able to			
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CO2	Explain the ergonomics with appropriate strategies		
CO3	Explain fire and electrical safety issues		
CO4	Explain Personal Protective Equipment (PPE)		
CO5	Explain occupational diseases		
CO6	Explain work place safety in construction industry and water and waste water treatment plants.		


Note : Answer all the questions.				
Q. No.	Question	Marks	RBT Level	CO
1	Explain the history of safety development.	2.5	L2	1
2	Explain the purpose of occupational safety and Health Act of India.	2.5	L2	1
3	Define 'Ergonomics'.Discuss the elements of OSHA's Ergonomic guidelines.	2.5	L1	2
4	Discuss the hazard preventions and control methods.	2.5	L1	2

Last date for submission	02	06	2021
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RBT (Revised Bloom's Taxonomy) Levels : Cognitive Domain		
L1 : Remembering	L2 : Understanding	L3 : Applying
L4 : Analysing	L5 : Evaluating	L6 : Creating

  
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Assignment No.	2	Maximum Marks	10
Semester	VI	Scheme	CBCS – 18
Course Co-ordinator	Sumana Y.B		
<b>Course Outcome Statements :</b> After the successful completion of the course, the students will be able to			
CO1	Explain the safety principles, right –to-know laws and manage situation applying theories of accident at workplace		
CO2	Explain the ergonomics with appropriate strategies		
CO3	Explain fire and electrical safety issues		
CO4	Explain Personal Protective Equipment (PPE)		
CO5	Explain occupational diseases		
CO6	Explain work place safety in construction industry and water and waste water treatment plants.		


Note : Answer all the questions.				
Q. No.	Question	Marks	RBT Level	CO
1	Classify the different types of fires and list the causes for each type of fire.	2.5	L2	3
2	Define product safety. Give the technical requirements for product safety.	2.5	L1	3
3	State various modes of transmission of diseases at work place. Recommend preventive methods for them.	2.5	L1	4
4	Explain the role of personal protective equipment during occupational activity.	2.5	L2	4

Last date for submission	15	07	2021
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RBT (Revised Bloom's Taxonomy) Levels : Cognitive Domain		
L1 : Remembering	L2 : Understanding	L3 : Applying
L4 : Analysing	L5 : Evaluating	L6 : Creating

  
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