



# Artículo Científico.

## Diagnosis, Evaluation , Prevention and Control of Occupational Risk Factors of Teachers , Administrative and General Services Engineering Faculty of Applied Science , Technical University of the North.

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### Summary

*"Everyone has the right to develop their work in a supportive environment and supportive to ensure their health, integrity, security, health and welfare" in the Constitution of the Republic of Ecuador, considering this legislation all organizations in the country are obliged to care for physical and mental health of their workers.*

*The study was based on the need to improve the working conditions of the staff of the Engineering Faculty of Applied Science, Technical Management performing Safety and Health at Work (identification, measurement, assessment and control of occupational hazards) that will help prevent incidents, accidents and diseases.*

*Identification was performed by applying risk encuestas, interviews and observation of work environments, identified risk measurement and comparison with national legislation, then proceeded to evaluate the 1068 risks identified by applying the criteria Triple Method (Probability, severity and vulnerability), finally obtained the degree of danger of the risks identified in the management being prioritized by severity preventive and published in the risk identification matrix.*

*It helped 100 workers of the Engineering Faculty of Applied Science, in order to improve the performance of human talent and prevent injuries and illness in the health of staff.*

**Keywords:** Safety, Health, Risk Management, Technical, Jobs.

## 1. Introduction

The risks of labor are harmful eventualities to which the worker is exposed as a result of their work, which can become fatal if not identified and controlled in time; it is the obligation of employers to provide safe working environments.

The research will be conducted in Northern Technical University located in the city of Ibarra in the Barrio el Olivo and to this particular study will be referred to the Engineering Faculty of Applied Science - FICA, since we do not have a Technical System Safety and Health at Work does not guarantee its workers and students hazard controlled environments.

And knowing the problems that can cause occupational hazards, whether, in the worker's health, productivity of their processes, economy and causing legal problems for the employee and employer, this study was conducted in different areas and sectors of the campus.

The aim of the study is to diagnose, evaluate, prevent and control occupational risk factors of staff performing their daily activities in this center of higher education and ensure safe work environments and comply with Health and Safety Legislation in Work.

## 2. Materials and Methods

Below is the materials, tools and methods used in conducting the Technical System Safety and Health at Work of the Engineering Faculty of Applied Science:

### Survey process.

We performed the lifting of personnel processes under study (100), taking into account the micro, meso and macro processes, which helped highlight the activities of the workers.

### Polls

Was used a questionnaire to all the risks associated with the proposed risk identification matrix.

### Interviews

Staff with specific lectures, related to incidents, accidents and diseases arising in the work environment.

Tools that helped 1068 identifying occupational hazards present at the Engineering Faculty of Applied Science.

### Measuring work environment.

By identifying insufficient lighting in the work environment which is a physical hazard, we proceeded to the measurement.

### Illuminance.

The equipment used to measure this risk was the delta portable light meter ohm, specialized equipment for measuring this risk.

They look the measurement points, calculated by the method of zonal cavities in these measurements were taken points q then should be compared to the Ecuadorian legislation.

In case of non-compliance should calculate the number of luminaires needed:

### Average illuminance

$$E_{prom} = \frac{\sum_i^n E_i}{n}$$

### Uniformity

$$Uniformidad = \frac{E_{min}}{E_{prom}}$$

### Risk Assessment.

Each identified risk must be evaluated by applying the three-part test method

### Triple Method Criterion.

Method to quantify the risk with an analysis of Probability, Severity and Vulnerability:

- Likelihood is time to which the worker is exposed to the risk factor.
- Severity of damage, an assessment is made at the discretion of the analyst which can be harmful risk.
- Vulnerability management is taking place before the risk factor so that we become vulnerable to this.

CUALIFICACION O ESTIMACION CUALITATIVA DEL RIESGO - METODO TRIPLE CRITERIO - PGV											
PROBABILIDAD DE OCURRENCIA			GRAVEDAD DEL DAÑO			VULNERABILIDAD			ESTIMACION DEL RIESGO		
BAJA	MEDIA	ALTA	LEGERAMENTE DAÑO	DAÑO	EXTREMAMENTE DAÑO	ALGUNA GESTION (acciones parciales al sitio)	NINGUNA GESTION (proceso personal)	NINGUNA GESTION	RIESGO MODERADO	RIESGO IMPORTANTE	RIESGO INTOLERABLE
1	2	3	1	2	3	1	2	3	4 x 3	6 x 5	9 x 7
RIESGO MODERADO			RIESGO IMPORTANTE			RIESGO INTOLERABLE					

The estimation method is performed by summing the score of 1 to 3 of each parameter.

If the result of the sum of the evaluation is within the following ranges of risk is classified as follows:

- If the risk is between 4 and 3, will be considered moderate risk, and take the yellow color.
- If the risk is between 6 and 5, will be considered significant risk and take the orange.
- If the risk is between 9.8 and 7, will be considered intolerable risk and take the red.

The results obtained must be transcribed to the risk identification matrix with its own color.

### Prevention and control.

The following risks were prioritized taking into account the severity of each of these evaluation results.

### Prioritization of risks.

First will be considered as intolerable risks that could cause extremely harmful to worker injuries or death, then take into account major risks that can likewise cause harm to the health of workers and finally we consider moderate risks.

Then you need to consider the following control for each of the prioritized risks.

It should analyze the possibility of controlling the risk at source, transmission medium, and the addition worked as the established order.

Each risk should have at least one of these controls.

GESTIÓN PREVENTIVA					
PRESENTA EL RIESGO	PROPIEDAD DEL RIESGO PRIORIZADO	FUENTE acciones de sustitución y control en el sitio de generación	MEDIO DE TRANSMISIÓN acciones de control y protección relacionadas entre la fuente generadora y el trabajador	TRABAJADOR mecanismos para evitar el contacto del factor de riesgo con el trabajador: EPPs, adiestramiento, capacitación	COMPLEMENTO servicio a la gestión: evaluación, información, comunicación, investigación

### Auditing

Every organization should be audited to demonstrate its Safety and Health at Work.

You can make a mini audit taking into account the parameters established by the Health and Safety legislation at Work and the Social Security Institute, in order to highlight the level of compliance of the organization.

It should be noted that this audit is done by the Ecuadorian Social Security Institute who is the only organization in the country with the power to do it.

### 3. Results

Table of results of identification and risk assessment.

RESULTADOS DE LA IDENTIFICACION Y EVALUACION DE RIESGOS EN LA FACULTAD DE INGENIERIA EN CIENCIAS APLICADAS																								
DEPARTAMENTO	PROCESO	FISICOS			MECANICOS			QUIMICOS			BIOLOGICOS			ERGONOMICOS			PSICOSOCIALES			ACCIDENTES MAYORES			TOTAL	
		MOD	IMP	INT	MOD	IMP	INT	MOD	IMP	INT	MOD	IMP	INT	MOD	IMP	INT	MOD	IMP	INT	MOD	IMP	INT		
DECANATO	DECANO	4	1		5	1		3			3			2	1		8				1		29	58
	SECRETARIA DECANATO	3	2		7	1		3			3			2	2		4	1			1		29	
SUBDECANATO	SUBDECANO	4	1		5			2			3			1	2		4	4			1		27	55
	SECRETARIA	5			7			3			3			1	2		6				1		28	
SECRETARIO ABOGADO	SECRETARIO ABOGADO	4	2		5	1		2			3			4	2		2	7			1		33	60
	SECRETARIA DEL SECRETARIO ABOGADO	4	1		5	1		2			3			1	3		4	2			1		27	
PLANTA ACADEMICA TEXTIL N° 1 y 2	ENCARGADO PLANTA TEXTIL	2	2		3	5		3	2					1	2		3	1			3		27	106
	AUXILIAR DE SERVICIO	1	3		4	3		1	1		1			1	1		1	1			1		19	
	AUXILIAR LABORATORIO MABUFACTURA FICA	3	3		6	4								1	2		4	1				1	25	
	ASISTENTE DE LABORATORIO PLANTA TEXTIL N° 2	6			3	6		2	1		1	1		1	2		7	2	1		2		35	
CARRERA DE INGENIERIA INDUSTRIAL	COORDINADOR	4	1		6	1		3			3			1	2		6				1		28	105
	SECRETARIA	4	1		6	2		3			4			4			7				1		32	
	DOCENTES	4	2	1	12	1		7			4			3	2		3	4			2		45	
CARRERA DE INGENIERIA TEXTIL	COORDINADOR	6			7	1		1			3			2	1		7				1		29	105
	SECRETARIA	5			6	1		2			3			4	1		7				1		30	
	DOCENTES	7		1	12	1		3	3		4			3	2		7				3		46	
CARRERA DE INGENIERIA EN SISTEMAS	COORDINADOR	5			6			2			3			1	2		6				1		26	92
	SECRETARIA	3			8			2			3			2	2		7				1		28	
	DOCENTES	4		1	9	1		3			3			4	2		8				2	1	38	
CARREARA DE INGENIERIA EN MECATRONICA	COORDINADOR	3	1		6			2			3			3	2		6				1		27	90
	SECRETARIA	4	1		7			2			3			1	3		5				1		27	
	DOCENTES	5	1		9	1		3			3			3	2		7				1	1	36	
CARRERA DE INGENIERIA EN ELECTRONICA	COORDINADOR	4	1		6			2			3			4			5				1		26	92
	SECRETARIA	5			6			2			3			2	3		6				1		28	
	DOCENTES	7		1	10	1		2			4			2	2		7				1	1	38	
LABORATORIOS	LABORATORISTA DE INFORMATICA	3	2	1	11	2		3			2	1		2	2		3	4			4		40	106
	AUXILIAR DE LABORATORIO	4	1		9	2		2			3				4		10	1			3	1	40	
	ASISTENTE DE LABORATORIO TEXTIL		2	1	4	4		1	3						1		2	2			6		26	
AUXILIARES DE SERVICIO	AUXILIAR DE SERVICIOS 1	4	5		11	7	1	5	2		7			3	4		10	1			1	6	67	199
	AUXILIAR DE SERVICIOS 2	4	5		11	7	1	5	2		5	2		2	4		10	3			1	6	68	
	AUXILIAR DE SERVICIOS 3	4	5		10	8	1	5	1		7			2	4		10	1			1	6	65	
<b>TOTAL</b>		<b>125</b>	<b>43</b>	<b>6</b>	<b>221</b>	<b>62</b>	<b>3</b>	<b>81</b>	<b>15</b>		<b>93</b>	<b>4</b>		<b>59</b>	<b>68</b>		<b>182</b>	<b>35</b>	<b>1</b>	<b>24</b>	<b>44</b>	<b>2</b>	<b>1068</b>	<b>1068</b>
			<b>174</b>		<b>286</b>			<b>96</b>			<b>97</b>			<b>127</b>			<b>218</b>			<b>70</b>			<b>1068</b>	

## Result Matrix Occupational Hazard Identification Engineering Faculty of Applied Science.

UNIVERSIDAD		FACULTAD		CARRERA		CURSO		SEMESTRE		CATEDRÁTICO		ALUMNO		GRUPO		FACTORES DE RIESGO																														CUALIFICACION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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NOMBRE	UNIVERSIDAD NACIONAL DE INGENIERIA											N°	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976

#### 4. Conclusions

After the study, it was established preventive measures for staff and students who work at these facilities to do their jobs more safely, based on the objectives in this research it was concluded that:

The diagnosis made at the Engineering Faculty of Applied Science in Occupational Safety and Health 1068 hauling the result of occupational hazards identified, which are divided among the different risk factors, taking into account the group of people and students that make up the faculty, the diagnosis was very encouraged by what is taking steps to remove them and control them.

We performed the 1068 assessment identified risks using the method recommended by the risk identification matrix ( three part test method ) and obtained a score of 785 moderate risks , significant risks and 12 271 intolerable risks which were prioritized preventive management .

Was established risk control by implementing preventive management recommended by the risk identification matrix, which are prioritized all risks considered in the evaluation, intolerable and significant risks, which received adequate treatment.

Most people agree affected by ergonomic hazards in their job for the various positions to be taken by their daily work.

There are no emergency exits as the building only has one entrance and exit.

Students and teachers, when performing hazardous activities, do not make use of personal protective equipment because they do not have these.

If you follow through and compliance with the provisions of the study may spend an external audit is prepared by the Social Security Institute Security through General Occupational Hazards entity that has the authority to audit the security companies and occupational health and is a legal requirement for the operation of the university.

#### 10. Acknowledgements

I thank Mr. Marcelo Puente study director, who was the person who guided me and I offer all their knowledge to successfully complete degree work.

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