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Analysis & Design Of Offshore Central Control Room Building For Various Loading Conditions Using Different Codes Of Practice

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Abstract: *The state-of-the-art design finds its way into practice through specifications and stipulations of relevant codes. In India, several development works have taken place for improving the material properties of steel, yet the design is uneconomical at times due to non-availability of efficient sections. The design codes are being updated and modified incorporating the results from the various researches and developments being carried out at the various R & D centers in the country*

This paper highlights the comparison of IS: 800 -1984, 2007 and AISC-ASD, LRFD the building involved here is an offshore central control room building. The findings are encouraging as the philosophy is more scientific. In the offshore industry moreover working stress design is used due to the heavy wind and equipment loads coming on to the structure.
This paper reviews recent development in fire engineering. The yield strength reduction factors of steel at elevated temperatures for different strains are considered and the reduction in yield stress and young's modulus must be noted down.

1. INTRODUCTION

The In-place analysis and load out analysis is to be performed.CCR-Room will be modeled in STAD-PRO.The walls also will be modeled as plate elements. The equipment weights will be modeled at its appropriate locations on the remaining area of platforms. Wind load will be calculated based on API recommended Practice. The modeled will be pinned at its column locations and analysis will be performed to check the strength and stability of the members. After the analysis the model will check with IS and AISC codes by varying the partial safety factors.

1.1 ASD (Allowable stress design)

The allowable stress method of design, the critical Combination of loads is found out the members are design on the basis of working stresses. These stresses should never increase the permissible stresses is considered. The method considers material behavior is elastic. Thus the permissible stresses may be elaborated in terms of factor of safety,
Which takes care of overload or other unknown factors Thus, Permissible stress = Yield stress / factor of safety Thus, Working stress ≤ Permissible stress.

1.2 Load and Resistance Factor Design (LRFD)

In this method load on structure is considered and the resistance factor of material is considered in design considering yield stress. Basically LSM and LRFD both are same. There is difference is in the parameters and factors only in LSM and LRFD. With the advantage of modern state of the art design methodology in the form of the limit state method or the load and resistance factor design method, rationally and overall economy has become the key word in the design of steel structures.

1.3 Limit State Design (LSM)

Object of limit state design can be paraphrased as Achievement of an acceptable probability that a part or whole structure will not become unfit for its intended use. During its life time owing to collapse, excessive deflection etc. Under the action of all loads & load effects. The acceptable limits of safety and serviceability requirements before failure occur are called as limit state. For achieving the design objectives, the design shall be based on characteristic values for material strength and applied loads, which take into account the probability of variations in the material strengths and in the loads to be supported. The characteristic values shall be based on statical data, if available. Whereas such data is not available, these shall be based on experience. The design values are derived from characteristic values through the use of partial safety factors, both for material strength and for loads. In the absence of special consideration, these factors shall have the values given in this section according to the material, the type of load and the limit state being considered. The reliability of design is assured by satisfying the requirements.

Design action ≤ Design strength

2. COMPARISON OF UTILITY RATIOS OF MAIN BEAM RESULTS BY IS 800 AND AISC CODES:

Table 1. IS 800 : WORKING STRESS

S.NO	NO	DESIGN PROPERTY	ACTUAL RATIO	ALLOWABLE RATIO
1	532	ISMB600	0.945	1
	513	ISMB600	1.013	1
2	49	ISMB600	0.426	1
	49	ISMB600	0.426	1
3	97	ISMB600	0.305	1
	97	ISMB600	0.305	1

Table 2. IS 800: LIMIT STATE

S.NO	NO	DESIGN PROPERTY	ACTUAL RATIO	ALLOWABLE RATIO
1	532	ISMB600	0.917	1
	513	ISMB600	0.984	1
2	49	ISMB600	0.353	1
	49	ISMB600	0.353	1
3	97	ISMB600	0.266	1
	97	ISMB600	0.266	1

Table 3. AISC: Allowable stress

S.NO	NO	DESIGN PROPERTY	ACTUAL RATIO	ALLOWABLE RATIO
1	524	ISMB600	0.977	1
	524	ISMB600	0.977	1
2	49	ISMB600	0.332	1
	212	ISMB600	0.278	1
3	97	ISMB600	0.237	1
	97	ISMB600	0.237	1

Table 4 AISC: LRFD

S.NO	NO	DESIGN PROPERTY	ACTUAL RATIO	ALLOWABLE RATIO
1	524	ISMB600	0.567	1
	524	ISMB600	0.567	1
2	49	ISMB600	0.203	1
	212	ISMB600	0.252	1
3	97	ISMB600	0.16	1
	97	ISMB600	0.16	1

3. CONCLUSIONS DRAWN FROM THIS COMPARISON:

As general observation Indian code and British code includes safety factors allowing the users to obtain design values starting from characteristics values, whereas American approach. The following issues related to the comparisons among the codes considered in this work are described regarding design of beams subjected to combined forces. As per result discussion, after solving problems there is variation in the utility ratios obtained by three different codes because of variation in values of parameters or constant considered particular code are different and the main thing is that there is unavailability of same size section in both the codes.

4. FIRE ANALYSIS

Fire as a load condition requires that the following be defined:

1. Fire scenario.
2. Heat flow characteristics from the fire to unprotected and protected members.
3. Properties of steel at elevated temperatures.
4. Properties of fire protection systems.

4.1 Elasto-plastic method

Maximum allowable temperature in a steel member is assigned based on the stress level in the member prior to the fire. As the temperature increases the member utilization ratio may go above 1.0. A nonlinear analysis is performed to verify that a structure will not collapse and still will meet the serviceability criteria. Regardless of the design method the linearization of stress/strain relationship is done. A value of 0.2% strain is commonly used as that has a benefit of giving matched reduction in young's modulus and yield strength but has a disadvantage of limiting the allowable temperature of steel at 400 .So we are linearizing the stress/strain at 550 C at 1.4%.It could be seen that the yield strength is reduced to a factor of 0.6 but young's modulus is reduced by a factor of 0.09(=0.6x0.2/1.4). So in the case B we linearized yield strength by 1.4% and young's modulus by 0.2%. The reduction in young's modulus and yield strength was found out to be 0.6.

Table 4: Yield reduction factors:

		Strain		
Temp ©	0.2%	0.5%	1.5%	2.0%
100	0.940	0.970	1.0	1.0
150	0.898	0.959	1.0	1.0
200	0.847	0.946	1.0	1.0
250	0.769	0.884	1.0	1.0
300	0.653	0.854	1.0	1.0
350	0.626	0.826	0.968	1.0
400	0.600	0.798	0.956	0.971
450	0.531	0.721	0.898	0.934
500	0.467	0.622	0.756	0.776
550	0.368	0.492	0.612	0.627
600	0.265	0.378	0.460	0.474

5. CONCLUSION

As we are considering 400˚C as the critical temperature for some members where it is more critical the yield reduction factor comes out to be 0.6 for strain level 0.2%. And the other members are designed for a temperature of 200˚C and strain level 0.2% the yield reduction factor comes out to be 0.8. The method used here is elasto-plastic method.

6. ACKNOWLEDGMENTS

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7. REFERENCES

[1] Arijit Guha and Dr.T.K. Bandyopandhya, "*Structural Member Design Based on Draft IS: 800 (Limit State Method), Insdag's steel journal*", Institute for steel development & Growth, Jan 2004, Volume5.

[2] N. Pandian, Arul Jayachandran, S. Seetharamal, "*Structural Efficiencies of New Indian Wide Flanged Sections Compared With the Existing Rolled Sections*", *Insdag's Steel Journal, Institute* for steel development & Growth, Jan 2004, Volume5.

[3] Rangachar Narayanan, V.Kalayanarman, etal "*Teaching Resource on Structural Steel*" Design Volume 1 of 3, Institute For Steel Development & Growth.

[4] Indian Standard General Construction in Steel- Code of Practice "*IS: 800-2007*", December 2007.

[5] Indian Standard General Construction in Steel- Code of Practice "*IS: 800-1984*".