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Effect of Fire on R.C.C. Structures

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Abstract

With the exaggerated incidents of major fires in buildings; repairs, assessment and rehabilitation of fireplace broken structures has become a topical interest. This can be a specialized field involves experience in several areas like material science, testing and concrete technology, structural engineering, repair techniques and materials etc. analysis and biological process efforts square measure being applied during this space and different connected disciplines. During this topic the expertise of reality issues square measure conferred that add large price to the current. this subject additionally offers a comprehensive data on the overall strategy for the restoration of fireplace broken buildings and additionally presents an assessment of the assessment procedures by completely different non damaging techniques, specifications and execution of repair techniques. The experimentation has been done to search out the impact of the hearth on reinforcement steel bars by heating the bars to 100°, 300°, 600° and 900° C of six samples each. The heated samples square measure quickly cooled by extinguishing in water and ordinarily by air cooling. The modification within the mechanical properties square measure studied victimization universal testing machine (UTM) and also the microscopic study of grain size and grain structure is studied by scanning microscope (SEM). The general conclusion is that majority of fireplace broken RCC structures square measure serviceable. However the impact of elevated temperature higher than 900°C on the reinforcement bars was discovered that there's important reduction in malleability once quickly cooled by extinguishing. Within the same case once cooled in traditional atmospherically conditions the impact of temperature on malleability isn't high. By heating the reinforcement bars, the mechanical properties will be modified while not variable the chemical composition.

Keywords: *R.C.C. Structures, Fire, UTM, SEM.*

Introduction

With the inflated incidents of major hearths and fire accidents in buildings; assessment, repair and rehabilitation of fireside broken structures has become a topical interest. This specialized field involves experience in several areas like concrete technology, material science and testing, structural engineering, repair materials and techniques etc. Analysis and development efforts are being carried out in these connected disciplines. Any structure will endure hearth accident, however thanks to this the structure can't be denied neither abandoned. To form a structure functionally viable once the harm thanks to hearth has become a challenge for the technology community. The matter is wherever to begin and the way to proceed. It's vitally vital that we tend to produce buildings and structures that defend each individuals and property as effectively as potential. Annual statistics on losses caused by hearths in homes et al. work some unpleasant readings and sadly through these events we tend to learn a lot of regarding fire safety design.

We are all responsive to the harm that fireplace will cause in terms of loss of life, homes and livelihoods. A study of sixteen industrial nations (13 in Europe and the USA, North American country and Japan) found that, during a typical year, the quantity of individuals killed by fires was one to two per 100,000 inhabitants and therefore the total price of fireside harm amounted to 0.2% to 0.3% of GNP. Within the USA specifically, statistics collected by the National hearth Protection Association (USA) for the year 2000 showed

that quite 4,000 deaths, over 100,000 injuries and quite $10bn of property harm were caused by hearth. Great Britain statistics counsel that of the 500,000 fires once a year attended by firefighters, regarding one third occur in occupied buildings and these end in around 600 fatalities (almost all of that happen in dwellings). The loss of business ensuing from fires in business and workplace buildings runs into many pounds every year. The extent of such harm depends on variety of things like building style and use, structural performance, hearth termination devices and evacuation procedures. Though hearth safety standards are written with this categorical purpose, it's intelligibly the security of individuals that assumes the bigger importance. Applicable style and selection of materials is crucial in guaranteeing hearth safe construction. Codes and laws a fire safety are updated regularly, sometimes as a results of analysis and development.

Results

Results from Computerized UTM

Table 1: Properties for Ordinary Cooling Conditions

S. No.	Room Temperature in ° C	Ultimate load (kN)	Ultimate stress (kN/mm^2)	Yield stress (kN/mm^2)	Max. extension (mm)	Elongation (%)	.2% proof stress
1	27	67.1	0.583	0.466	1.63	28.3	0.465
2	100	66.1	0.584	0.469	1.66	15	0.461
3	300	65.5	0.582	0.451	1.422	30	0.44
4	600	68.4	0.606	0.453	0.972	23.3	0.456
5	900	78.3	0.692	0.469	0.206	11.6	0.534

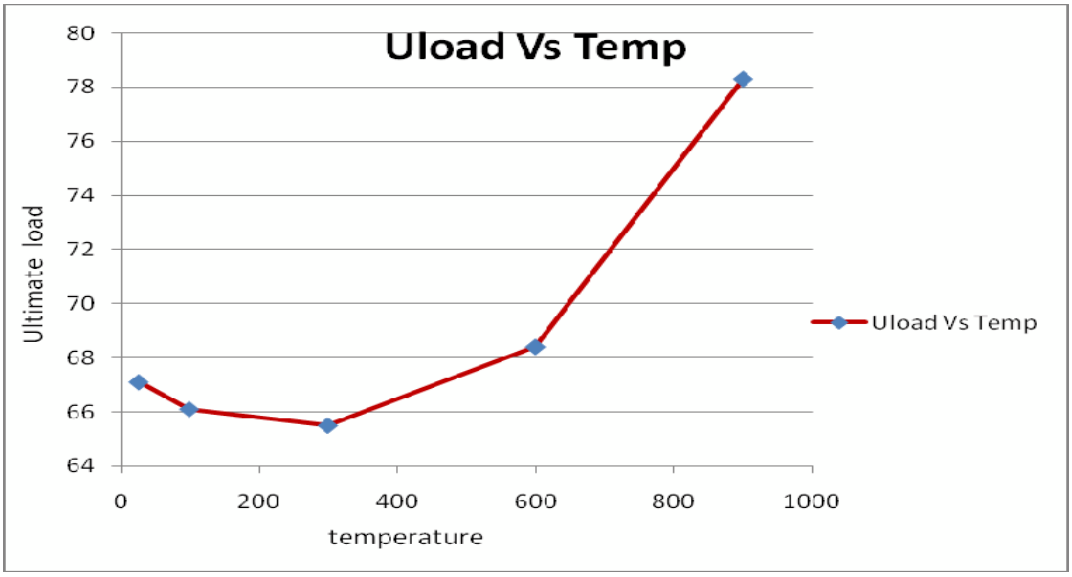

Figure 1: Temperature vs Ultimate Load

It can be observed that the ultimate load initially decreases and then gradually increases, this happens due to the microstructure of the bar. For high temperatures the grain size decreases.

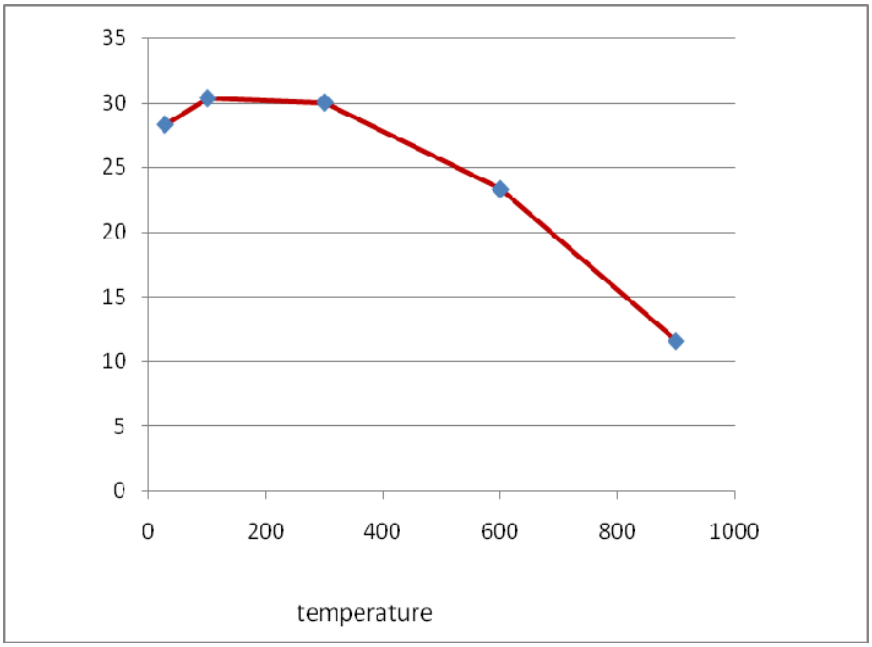

Figure 2: Temperature vs % Elongation

It can be observed that the % Elongation initially increases and then gradually decreases, this happens due to the microstructure of the bar. For high temperatures the grain size decreases.

Conclusions

i.) The impact of fireside on the reinforcement bars heated at numerous temperatures of 100° C, 300° C, 600° C, 900° C, cooled quickly by termination in water and usually cooled within the atmospherical temperature were studied and it's ascertained that the plasticity of quickly cooled bars once heating to extreme temperature to 900 ° C.

ii.) Finding out the characteristic changes in the mechanical properties of the bars by enduringness testing victimisation Universal Testing Machine shows that the rise in final load and reduce in proportion elongation of the specimen that mean that there's important decrease in plasticity of the specimen.

iii.) Study of small structure of the bars victimization Scanning electron microscope (SEM) conjointly shows that the microstructure of extremely heated specimens varies while not varied the chemical composition which might have negative impact on the structure.

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