

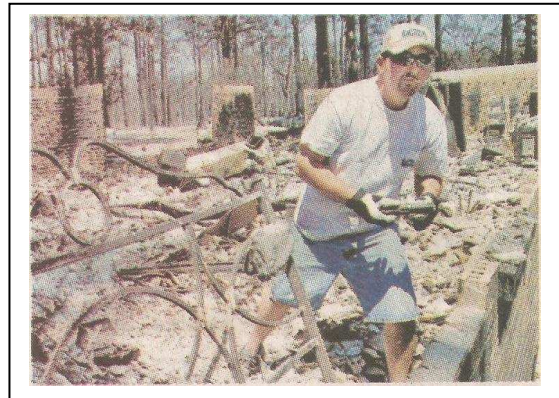
## Ferrocement – the best fire resistant material of construction

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It is usual wide-spread fire takes place every now and then in USA. The areas of several hundred Sq. Kmtrs. of forests are destroyed due to fire. The houses in human habitation near such forests get destroyed totally since these are made of wood. Enclosed photographs show the heavy devastation in Texas due to fire. Ferrocement resists fire with the least damage and is most suitable for the house construction. Whatever little damage to ferrocement houses due to fire can be repaired conveniently.



Wildfire in Graford, Texas Free  
Press Journal 07-09-2011



Mumbai Samachar (Gujarati)  
dated 9-9-2011



Free Press Journal  
dated 08-09-2011

During the fire at Texas, US, 700 houses have been destroyed with 5000 people leaving their houses. There has been 18700 blazes. every now and then since December 2010 covering a large area of 3.5 million acres.

The devastation of wooden houses can be prevented by construction of Ferrocement houses. Ferrocement resists fires for 1 1/2 hours against a temperature of 1700 ° C. The damage to the houses is negligible and can be repaired.

Ferrocement resists fire better than RCC and steel. Ferrocement - is efficient fire resistant material. Ferrocement is sustainable against fire. Ferrocement resists fire due to it being almost insulating material at the same time having isotropic feature till about 35% of the yield. The expansion of Ferrocement due to fire is without any splitting, cracking of cement matrix and detachment from steel surfaces, the bond being very high. Also there is almost nil surplus water for steam formation. And this resistance is so strong that no damage is caused even upto high

temperature of 1700 ° C. for 1 ½ hours. Also ferrocement has resisted temperatures 800 – 1000 ° C. for a period of 2 years with negligible easily repairable damage. . Ferrocement has low conductivity of 0.27W/mK as compared to 0.7 W/mK for brick work and 1.4 W/mK for concrete. Following is the supporting information that ferrocement is a very good fire resistant material

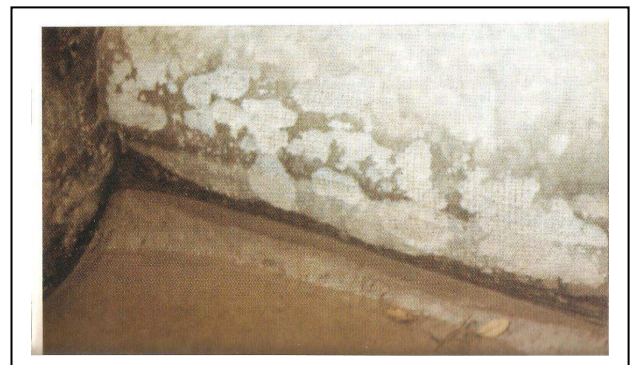
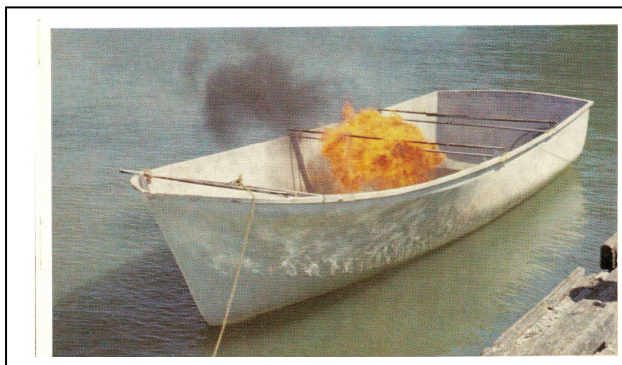
It has been stated in the publication “BOATS FROM FERRO-CEMENT”, United Nations Industrial Development Organisation, UNIDO, Vienna, UNO 1972 that “Ferro-cement is also fire-resistant and, under normal circumstances, will withstand even a major fire without suffering serious damage. A boat hull made of this material will resist fire much better than one constructed of either timber or fiberglass”.

The following fire tests were carried out by UNIDO as below:-

#### FIRE TEST

“Two gallons of petrol were poured into the sump and bilges of the boat and fired. The fire initially burned very strongly in the engine sump and between two bulkheads contained approximately one and a half gallons of petrol. The flames were considerable and during the fire, which lasted for about eight minutes, a popping sound could be heard which was later identified as the spalling off of small pieces of surface mortar.

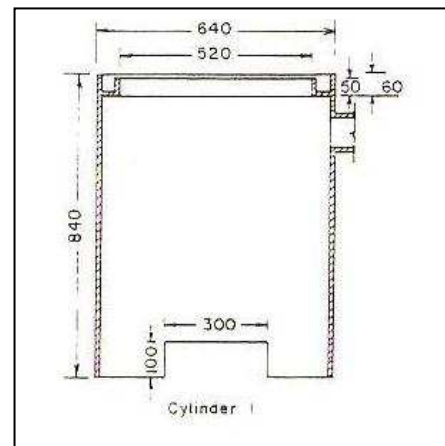
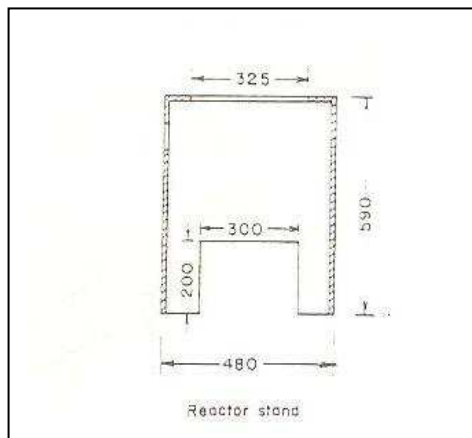
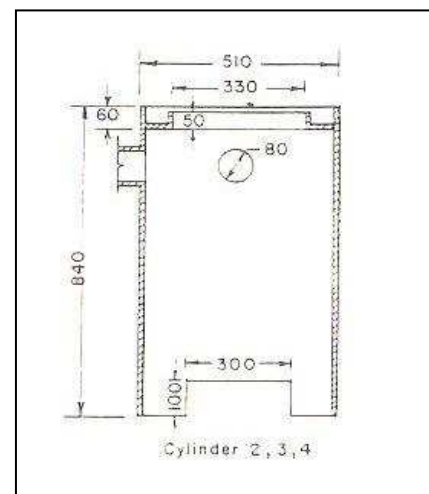
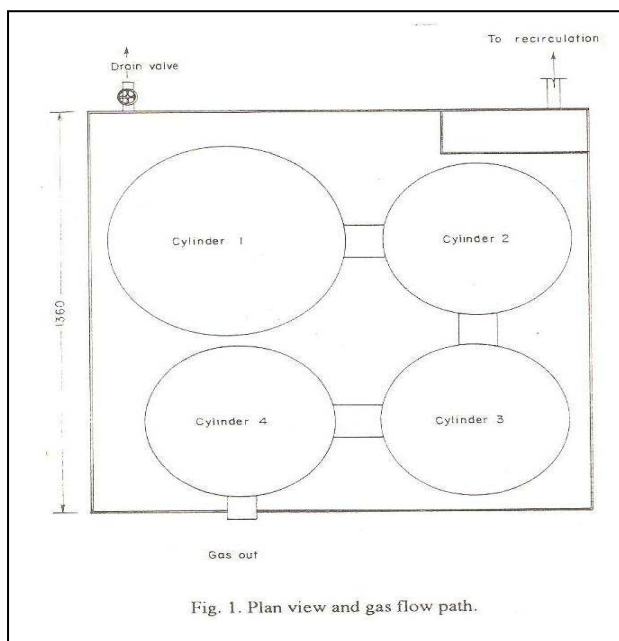
At the conclusion of the test it was found that although slightly blackened, the main hull itself was in good condition, though there was a slight surface spawling of the mortar in the areas immediately adjacent to the confined petrol. No serious damage of any sort was suffered and repairs to rectify the spawling were relatively simple. No damage to the paintwork on the outside of the hull could be observed and there was no sign of damage to any of the areas on the outside of the hull which had been filled with plaster owing to the inadequate penetration of the first application of the mortar”.



Mr. T.M. Hagenbach leading Boat Building Industrialist, UK, during sixties and seventies alongwith Mr. Eric A. Stevenson, a well experienced blacksmith subjected Ferrocement panel size 0.9 x0.9 mtr. x 25 mm to fire. Initially it became dull red, later turning to bright red, subjected temperature to 1700° C for 1 ½ hours. On cooling no defect or deterioration was detected . Mr. Hagenback constructed chimneys (Journal of Ferrocement, July 1986) . A Ferrocement chimney was constructed about thirty years before in UP, India

For burning of rice husks, Ferrocement incinerator, 1500 mm dia , 1200 mm ht. was constructed. The burning fire of 400 - 750 °C for a period of about 3-4 days was sustained effectively by the incinerator (Third International Symposium on Ferrocement December 1988, Roorkee)

A Gasifier consisting of four ferrocement cylinders was manufactured for hot gas production for power generation. The temperature development was 800 – 1000 °C with daily operations. There was total resistance for a period of two years. After this nominal deterioration was observed on the ferrocement walls. However in the cylinder where gas temperature was 400 °C there was no sign of aging for three years of operation. The (Journal of Ferrocement, October 1992).



There are other research data where it is shown that fire resistance of Ferrocement is good but is not much of direct relevance

In the case of Fire test on boat by UNIDO, as an after effect the spalling and splitting of plaster is visible on surfaces of fire area of the boat. However the wiremesh is covered by mortar but is perceptible. This indicates that there was some water in the mortar which got converted into steam and created splitting of mortar in the cover. However even after this, the mortar on wiremesh was not dislodged and wiremesh and core inside remained intact. Whereas in the test carried out by Mr. T.M. Hagenbach and Mr. Eric Stevenson there was no such phenomena of spalling of cover mortar. Here this indicates that there was no surplus water in the cover which turned into steam and all body of Ferrocement remained intact and changed to brown and pink colour even upto 1700 °C. Similar phenomena took place in the case of Rice husk kiln. But it is to the attribute of unimaginable fire resistance that it has sustained the temperature of 800 to 1000 °C for a period of two years and that too without any perceptible repair requirement. Should we not say that Ferrocement is unimaginably fire resistant material in relation to RCC where fire resistance of about 2-3 hours is thought of and in the case of steel at temperature of 1700 °C it will almost melt? .

#### Conclusion:-

From the above, in view of extremely high fire resistance of Ferrocement and that too for long period, it can definitely be said that Ferrocement is far better fire resistance material as compared to RCC and steel whereas the structures are designed for fire resistance for about 3-4 hours. Then it is left for damage and collapse. Whereas in the case of Ferrocement structures it will not be so. However further research is suggested to confirm the fire resistance feature. In view of extra-ordinary fire resistance of Ferrocement against high temperatures for long periods it can safely be said that Ferrocement structures surpass quite a few hours more than codal provisions of ACI, ISI etc. Therefore Ferrocement structures are most relevant for construction of important buildings such as hospitals, schools, structures where large number of people gather.