5.7 HIGH PERFORMANCE CONCRETE

High Performance Concrete (HPC) is defined as the concrete which possesses high strength, high workability, high modulus of elasticity, high density, high dimensional stability, high resistance to chemical attacks and low permeability.

Normal concrete has low strength and low elastic modulus values which are due to,

1. Heterogeneous nature of the structure of the material.
2. Partially porus
3. Weak transition zone.

Properties of HPC

- Early strength for 24 hours should be more than 35 Mpa.
- Very early strength for 4 hours should be more than 17.5 Mpa
- Compressive strength should be more than 70 Mpa
- High degree of impermeability to prevent ingress of water/air/CO_2/SO_4 etc.
- High resistance to sulphate attack
- Smooth structured surface
- Absence of micro-cracking
- High level of corrosion resistance
- High electrical resistivity
- High chemical resistivity
- High resistance to abrasion, erosion, and cavitation.

Applications of HPC

- ✓ Pavements
- ✓ Bridges
- ✓ High Rise Structures
- ✓ Hydro – Power Structures, etc.

Advantages of using HPC

- Reduction in member size and direct savings in the concrete volume saved.
- Reduction in the self-weight and super-imposed DL and smaller foundations.
- Reduction in form-work area and cost and high early age gain in strength.
- Construction of High – rise buildings.
- Longer spans and fewer beams for the same magnitude of loading.
- Reduced axial shortening of compression supporting members.
- Reduction in the number of supports and the supporting foundations.
- Reduction in the thickness of floor slabs and supporting beam sections
- Superior long-term service performance under static, dynamic and fatigue loading.
- Low creep and shrinkage.
- Greater stiffness as a result of a higher modulus of elasticity (E_c)
- Higher resistance to freezing and thawing, chemical attack
- Improved long term durability and crack propagation.
- Reduced maintenance and repairs.
- Smaller loss in value as a fixed cost.

Disadvantages of HPC

- The initially higher construction prices to be expected with the use of any new technology
- Quality control concerns related to various material selection, testing methods in use and the number of tests.
- Instabilities concerns that could result from reduced stiffness
- Fire resistance concerns