



CSIR-Structural Engineering Research Centre (CSIR-SERC), Chennai is a constituent laboratory of the Council of Scientific and Industrial Research (CSIR), Government of India. Established in the year 1965, CSIR-SERC has built up excellent facilities and expertise for carrying out R&D in the field of structural engineering covering analysis, design and testing of model / prototype structures as well as structural components. The centre has developed many cutting edge technologies for the construction industry and also offers various services to public and private sector organizations.

ADVANCED PROTECTIVE STRUCTURES AND MECHANICS LABORATORY (APSML)

The Advanced Protective Structures and Mechanics Laboratory (APSML) is a unique laboratory within CSIR-SERC, Chennai. Research in APSML prominently aims to develop innovative and efficient structural design for providing protection against extreme loads and high strain rate events (i.e. blast, impact, collisions and pounding) due to natural or man-made hazards. APSML covers a wide spectrum of research and development on shock absorbing composite materials and structures including buildings, crash barriers, bridge structures, above-ground/underground/underwater explosion resistant shelter structures of national importance and so on. Responses and failure mechanisms of various structures and materials under high strain rate events are predicted and studied computationally using advanced techniques involving finite element methods (FEM), meshless methods like peridynamics (PD) and smoothed particle Hydrodynamics (SPH), multiscale modelling, Fluid structure interaction (FSI), computational fluid dynamics (CFD). Besides this, low and high-velocity impact experiments are also performed to evaluate the performances of protective structures against impact loadings.

RESEARCH

Some of the important research and development areas of APSML include:

- Structural mechanics and design based on latest philosophies
- High velocity impact mechanics complimented with computational and experimental facilities
- Analysis and design of structures for natural, man-made and accidental industrial explosions/hazards etc.
- Impulsive loadings caused due to sloshing, pounding and shock etc.
- Development of innovative structural forms for enhanced shock resistance.
- Numerical simulation and prediction of shock response of structures
- Computational modelling of protective structures made of advanced cementitious composite materials
- Application of peridynamics (PD) and smoothed particle hydrodynamics (SPH) for simulating shock and impact response
- Research and development of textile reinforced concrete (TRC) and associated products

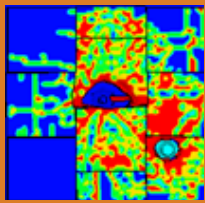
MAJOR FACILITIES

APSML is equipped with facilities for both numerical and experimental investigations on innovative structural forms and prototype designs. Existing facilities include:

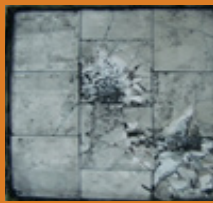
- Mechanical testing equipments for static and dynamic loading
- Instrumented impact testing machine (Model: CEAST 9350)
- Universal Testing Machine (Model: Tinius Olsen-H75KSUTM)
- High performance computing facility with nonlinear finite element programs
- Gas gun facility for impact performance evaluation of specimens

MAJOR PROJECTS

- Analysis and design of underground hardened shelters for the protection of critical facilities and humans against explosions
- Impact analysis of advanced ceramic metal composite protective panels
- Investigation on high velocity impact behaviour of steel fibre-reinforced cementitious composite panels under short projectile hits
- Development of laced steel concrete composite system for explosion resistance
- Finite element analysis and design of storage structures considering accidental explosions
- Structural integrity assessment of a massive concrete foundation using SSI
- Computational modelling, analysis and design of large floating offshore solar platform structures for renewable energy farming
- Textile reinforced concrete technologies and products
- Indo-German Collaborative Project: Modular lightweight wastewater treatment units made with TRC for rural and periurban dwellings (CleanWater)
- Precast Textile Reinforced Concrete U- Drains for storm water infrastructure (TRC U-drain)
- Development of high velocity multi-hit resistant movable protective booth/shack for security personnel



Numerical



Experimental

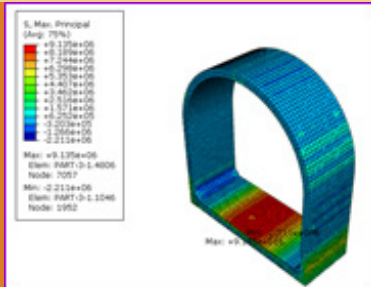
Impact damage pattern in composite Panels



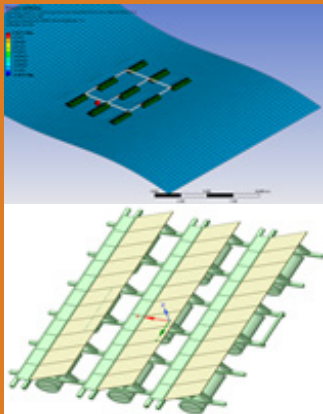
TRC Crash Barrier



LSCC system for blast resistance



Simulations of underground hardened shelter



FE analysis of offshore solar farm



Rectangular TRC WTP Unit



Circular TRC WTP Unit

TRC wastewater treatment units


For more details


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