The modern forms of reinforced soil walls were introduced by Henri Vidal. Since then design theories have been developed alongside an increasing database of full scale, small scale and centrifuge model tests. However, very little data is available on the mechanisms of deformation for a wrap-around wall. In order to understand these mechanisms, reinforced soil walls were tested under different conditions, by varying reinforcement stiffness, backfill material, external loading and type of construction. Seven centrifuge model tests on reinforced soil models were carried out with three different types of model reinforcements and a choice of two granular backfill materials. The external loading was imposed by a strip surcharge of 100 kPa, to represent the worst load experienced on a highway or railroad. This research programme includes the development of testing methods to obtain stress-strain behaviour of the model reinforcement using fixed or roller clamps, and improvement of the construction of the Cambridge strip load cells for measuring the tension along the model geosynthetic reinforcement, and in particular to the most sensitive, weakest reinforcement. Strip load cells have successfully yielded experimental data of reinforcement tension for all the geomaterials used. The tension measurement along the reinforcement confirms that the facing of a geosynthetic wrap-around reinforced soil wall does not serve a major structural function. Boundary relaxation occurs requiring the reinforcement simply to retain the fill. The deformation of the reinforced soil walls was identified by a simple displacement mechanism which included constant shear strain and dilation in the deforming zone. A non-dimensional horizontal deflection chart was derived based on this assumption. The prediction of the front wall deformation of centrifuge model walls using such a non-dimensional chart indicated that this would offer a useful serviceability design method to designers.