Conceptual Development of an Irradiator for Cross-linking of Cables using ^{60}Co gamma rays

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❖ **Ionizing energy is an efficient means of cross-linking the polymers to improve many cable properties including its insulation.**

❖ **E-beam cross-linking is the latest method of cross-linking. However there is a limitation of e-beam penetration in large diameter cables (>0.030 m dia.) restricting its application.**

❖ **The feasibility of processing multi core cables of large diameters with gamma rays was explored. The insulation jacketing of multi core cables are made of PVC or PE.**

❖ **The dosimetric aspects were studied for a cable irradiator- design which has been made in such a way that the cable will move through a pipe housed in Gamma Irradiation Cells (GICs) each of which have ^{60}Co source pencils (BRIT made BC-188) of 7.4 PBq arranged around the pipe in a suitable diameter (PCD). The pipe can accommodate cables of diameters up to 0.072 m. The cells have effective irradiation lengths (~1m) and lead shielding of adequate thickness.**

❖ **The dose profile in cables was evaluated when irradiated in a gamma irradiation cell in order to optimize the PCD of source pencil arrangement to get the appropriate Dose Uniformity Ratio with the specified target dose of 100 kGy & to arrive at no. of irradiation cells required for a suitable through-put.**

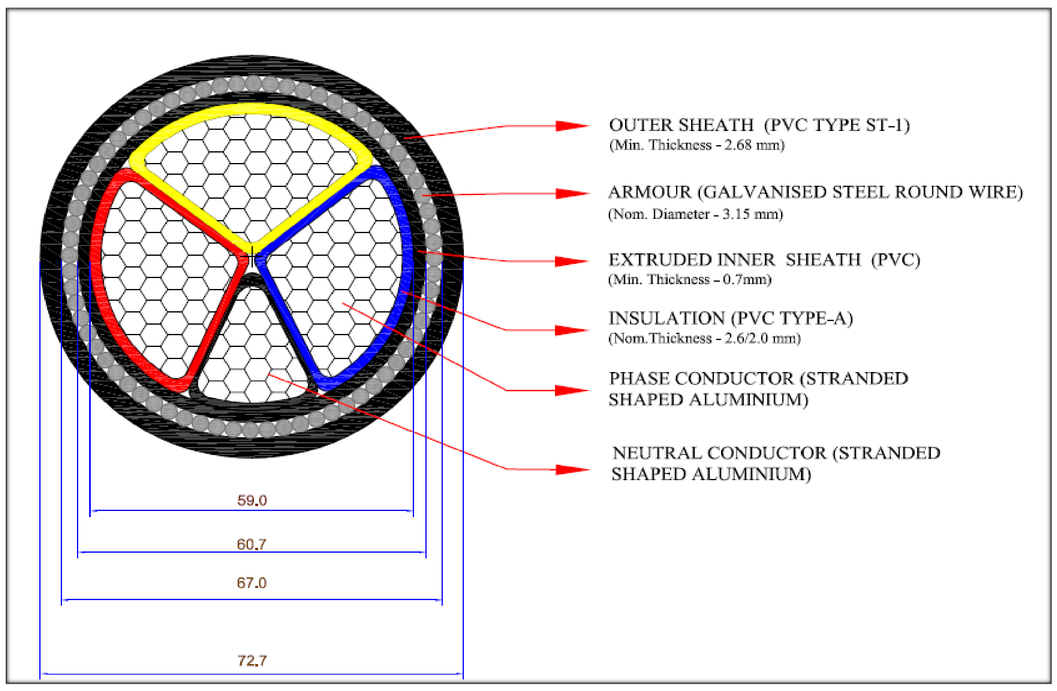

Fig.1 Cross-section of a cable of 72.7 mm

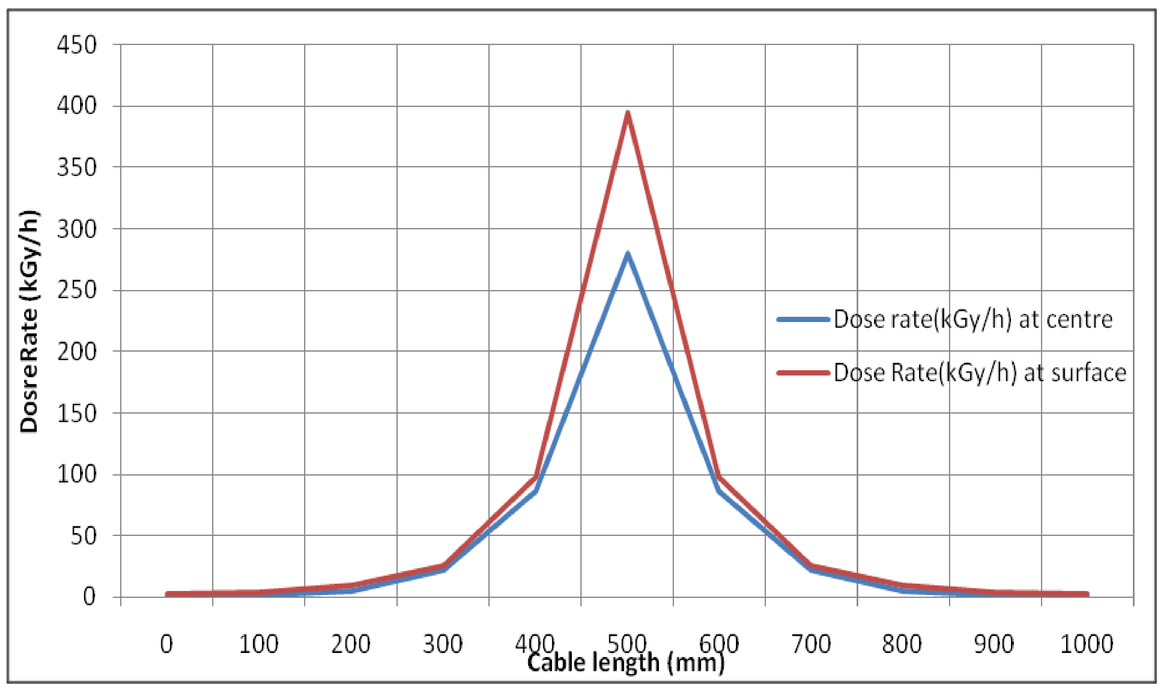

Fig.2 Dose profile of cable in a GIC

Table 1. DUR and throughput of multi-core cables

Cable dia.	Cable core details	DUR	Throughput
72 mm	3.5x400/185	1.99	84.8 cm/min.
65 mm	3.5x300/150	1.64	71.2 cm/min
58mm	3.5x240/120	1.47	64.6 cm/min
52 mm	3.5x185/95	1.34	60.0 cm/min
47 mm	3.5x150/70	1.25	58.0 cm/min
42 mm	3.5x120/70	1.21	56.4 cm/min

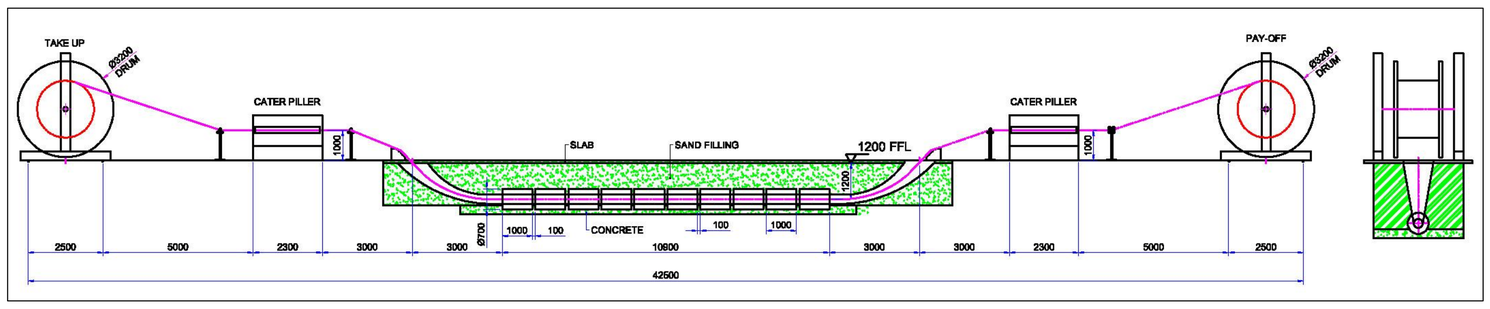

Fig.3 Layout for Cable Irradiation by ^{60}Co gamma rays