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Concept Design of the Heavy Duty Multi-Purpose Deployer For ITER

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The ITER presents the most demanding challenge to Remote Handling (RH) operation ever in terms of weight, complex geometry, limited space, required accuracy and task quality level. The ITER in-vessel components are to be maintained or replaced remotely since these components will be activated by high energy neutrons. In order to perform the in-vessel RH maintenance tasks, an RH system known as the Multi-Purpose Deployer (MPD) had been developed, hereunder, called as the Light Duty MPD (LD MPD). Based on the LD MPD design, an alternative version called as Heavy Duty MPD (HD MPD) is studied targeting to increase the payload capacity of the LD MPD. The HD MPD is based on the dual port operation that allows higher payload capacity than the LD MPD and prevents HD MPD equipment from contamination as the activated and contaminated in-vessel components are transferred from the nearby ports. The HD MPD Transporter has multiple degrees of freedom with a payload capacity up to 5.8 tons for the short configuration, and 4.8 tons for long configuration. Attaching an extension arm can further extend the long configuration for the rescue of the failed LD MPD. A concept design of the HD MPD has been developed to provide heavy load handling capability inside the VV, which can be used for blanket shield block (SB) handling. The different HD MPD configurations (short, long, long extended) are achieved by in-situ connection of the lower arm with the upper arm by means of an end-effector connector.

The work presented here includes the main design efforts for the development of conceptual envelope of the HD MPD as per the transfer cask and vacuum vessel constraints. The detailed feasibility and kinematic assessments have been carried out to determine the required degrees of freedom and HD MPD configurations for handling of the Neutral Beam region SB, the regular SB and rescue of the failed LD MPD. This paper summarizes the conceptual design of the HD MPD for various configurations and gives the recommendations for further design enhancements.

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