Ballasting or deballasting has the following consequences:

- Change of mass and mass distribution: changing the level in a ballast tank leads to a change in mass of the body and changes its roll, pitch and yaw radii. These changes affect the calculation of the body’s accelerations $(a = F / m)$.
- Due to the change in mass distribution the position of the CoG changes. The change in the vertical position leads to a change in the body’s stability.
- Application of a ballast load: the ballast load on a body follows from the change of mass of a ballast tank when compared to the tank’s mass at $t = 0$ s. The initial contents of ballast tanks don’t result in loads: it is assumed that they are incorporated in the body’s initial displacement.

(Note: the changes in mass are calculated but not yet applied in the calculation of the accelerations. All body mass properties (mass, radii and CoG) are available in the output signals.)

The ballast masses are considered as point masses: they don’t have radii of gyration and their positions on the body are constant (i.e. no change in vertical position with changing tank levels).

Ballast loads result in draft, heel and trim changes. The heel and trim moments are calculated w.r.t. the initial CoG of a body. The heel and trim arms of these moments are calculated in the earth-fixed coordinate system, so they change with the body’s heel and trim angles.

The changing vertical position of the CoG results in changing metacentric heights. This will affect the roll and pitch behaviour. It is accounted for by updating the hydrostatic restoring springs with the current $G_M$ and $G_I$ values. The coupling term heave-pitch in the restoring matrix is not changed. The $G_M$ and $G_I$ are recalculated at each integration time step.

Ballast procedures are defined by two arrays in the input file: one array with a sequence of time steps and one with a sequence of corresponding tank levels. The tank levels consist of a factor between 0 (empty tank) and 1 (fully filled tank). During a simulation the current tank levels follow from linear interpolation in the time and tank level sequences. The current ballast mass follows from multiplying the tank level with the given maximum mass of the tank.

The difference between the current ballast mass and initial ballast mass is used for the update of the body’s mass and for applying the ballast load. This is done at each integration time step.