

## Surfaces in equilibrium under a external vertical force field

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**Abstract.** We construct examples of  $[\varphi, \vec{e}_3]$ -minimal surfaces of grim reaper type and classify them as the only complete flat  $[\varphi, \vec{e}_3]$ -minimal surfaces. We also prove the existence of bowl-type and catenoid-type examples and give in some particular cases its asymptotic behavior. Finally, we prove an uniqueness result for complete embedded  $[\varphi, \vec{e}_3]$ -minimal surfaces with a single end that are asymptotic to the bowl-type example.