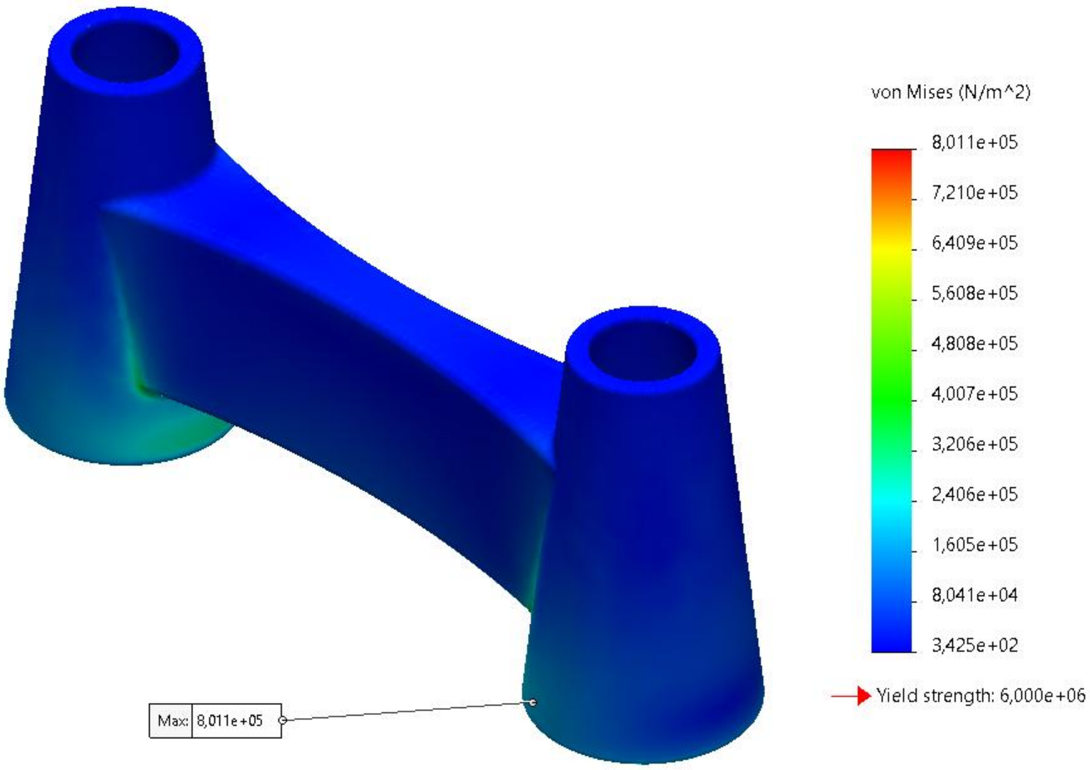
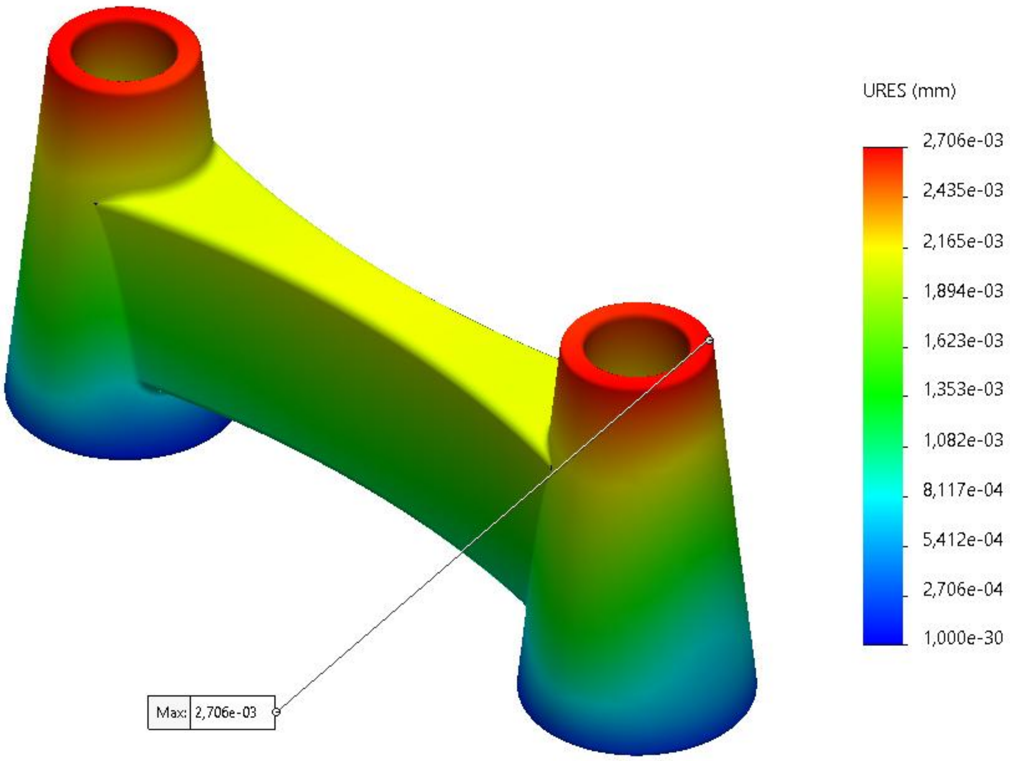
Stress test:



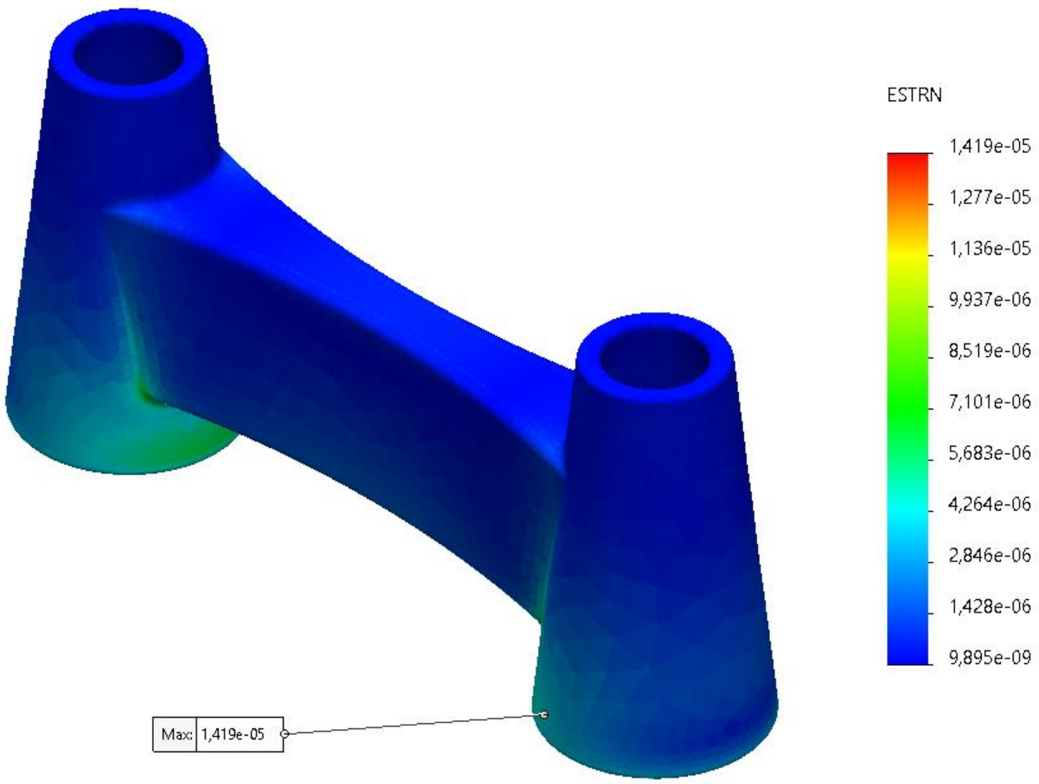
The simulation indicates that the basalt fabric reinforced concrete structure can withstand the applied underwater load case. With an external water pressure of approximately **300,128 N/m²** on all sides and gravity included, the maximum von Mises stress is about **0.801 MPa**, which is significantly lower than the assumed yield strength of **6.0 MPa**. This gives an estimated factor of safety of approximately **7.5**, meaning the structure remains well within the safe range. The highest stresses occur near the connection between the cone-shaped supports and the central beam, which is expected because these areas act as stress concentrations. However, the stresses remain below the material limit, so the design appears structurally safe for this simplified underwater pressure load case. Keep in mind that for concrete-based materials, it is also useful to check the maximum principal tensile stress, because cracking usually starts due to tensile stresses rather than yielding.

Displacement test:



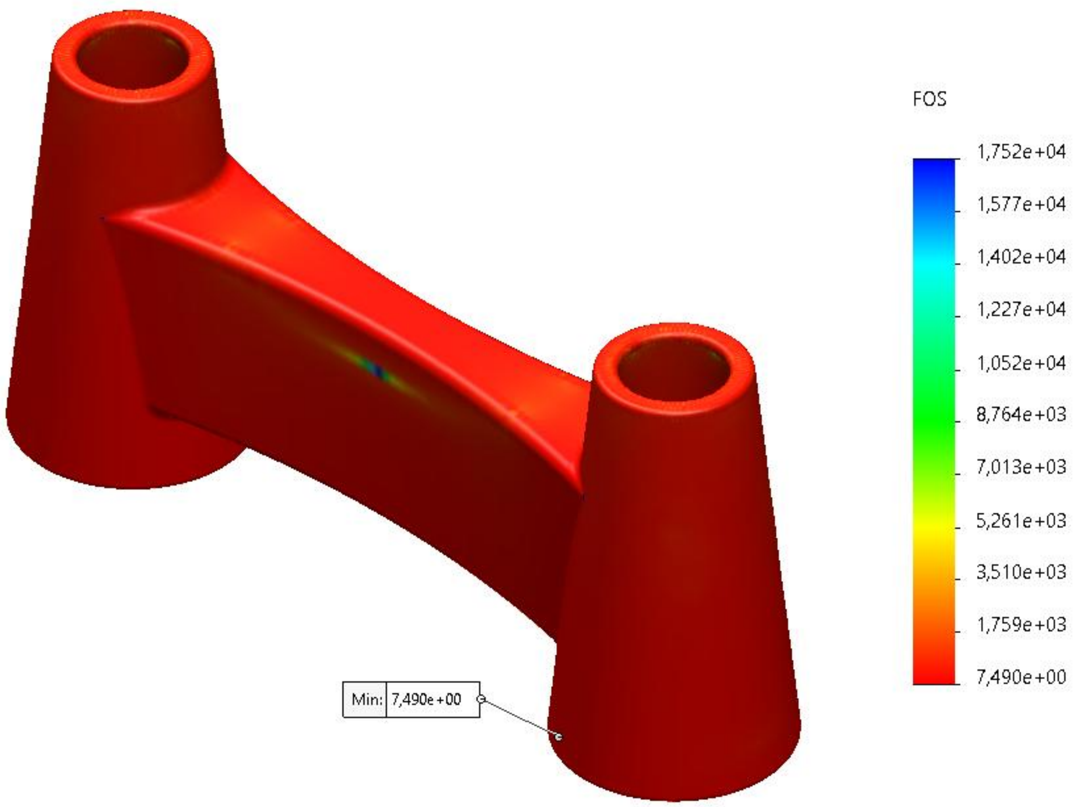
The displacement result shows that the structure deforms only very slightly under the applied underwater pressure and gravity. The maximum resultant displacement is approximately **2.706×10^{-3} mm**, which is only **0.0027 mm**. This is extremely small, meaning the structure remains very stiff under the simulated load case. The largest displacement occurs near the upper edges of the cone-shaped supports, especially around the openings, while the lower areas show almost no displacement. This deformation pattern is expected because the upper parts are less constrained and can move slightly more than the base regions. Overall, the displacement result confirms that the structure experiences negligible deformation at a depth of approximately 30 meters, so from a stiffness point of view the design appears safe for this simplified underwater loading condition.

Strain test:



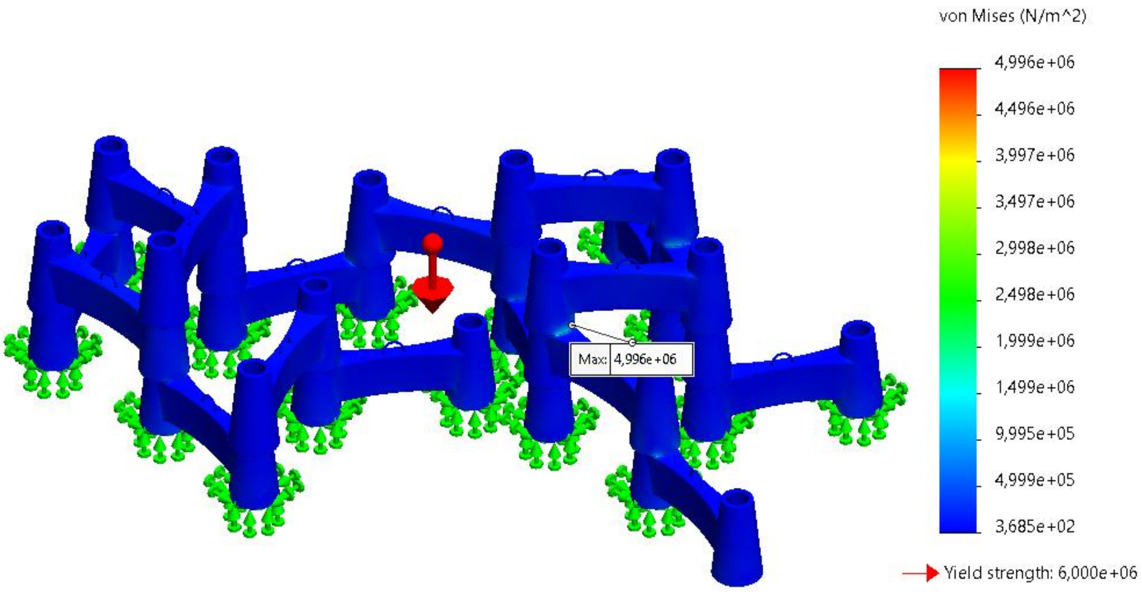
The strain result shows that the structure experiences very low deformation under the applied underwater pressure and gravity. The maximum strain is approximately **1.419×10^{-5}**, which is very small and indicates that the material is only slightly stretched or compressed. The highest strain occurs around the transition zones between the cone-shaped supports and the central beam, especially near the lower connection areas. This matches the stress result, where the same regions also showed the highest stress concentrations. However, the strain values remain low, meaning the structure is not deforming significantly and the material is behaving safely within the assumed load case. Overall, this strain plot supports the conclusion that the design is structurally stable under the simplified 30-meter underwater pressure condition.

Factor of safety:



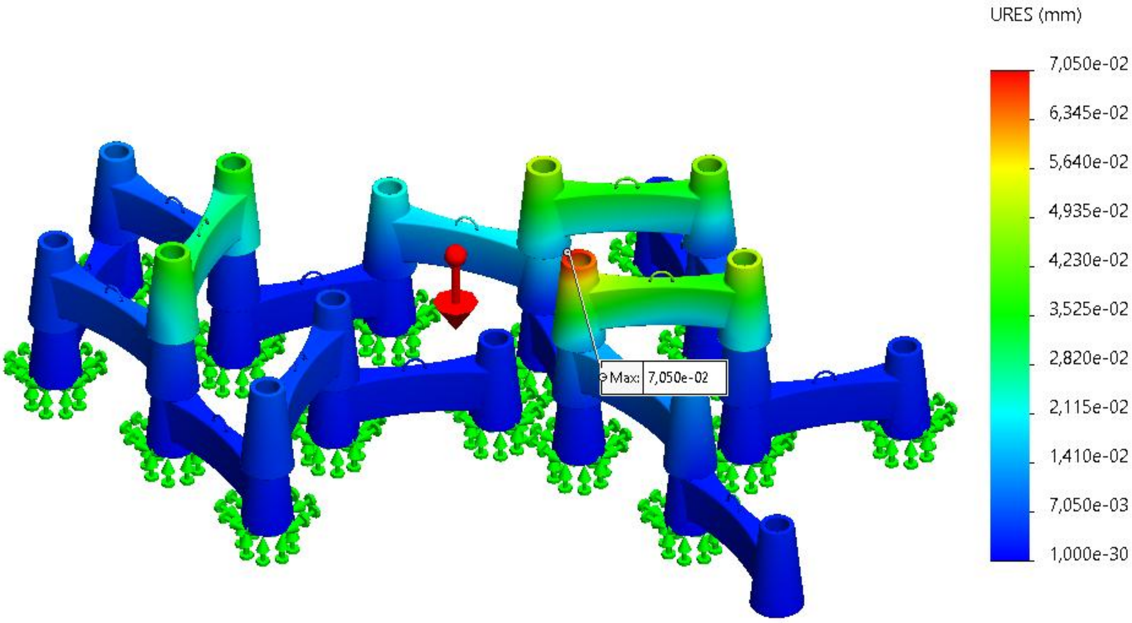
The factor of safety plot confirms that the structure remains safe under the applied underwater pressure and gravity load case. The minimum factor of safety is approximately **7.49**, which is well above the usual minimum requirement of **1.5–2.0** for many static structural checks. This means that the maximum stress in the structure is still far below the assumed material strength. Although most of the model appears red, this does not mean failure; it only means these areas have the lowest safety factor within the selected color scale. Since the minimum value is still around **7.5**, the structure has a large safety margin. The most critical region is again located near the connection between the cone-shaped support and the central beam, which matches the stress and strain results. Overall, the design appears structurally safe for this simplified 30-meter underwater loading condition.

Stress test:



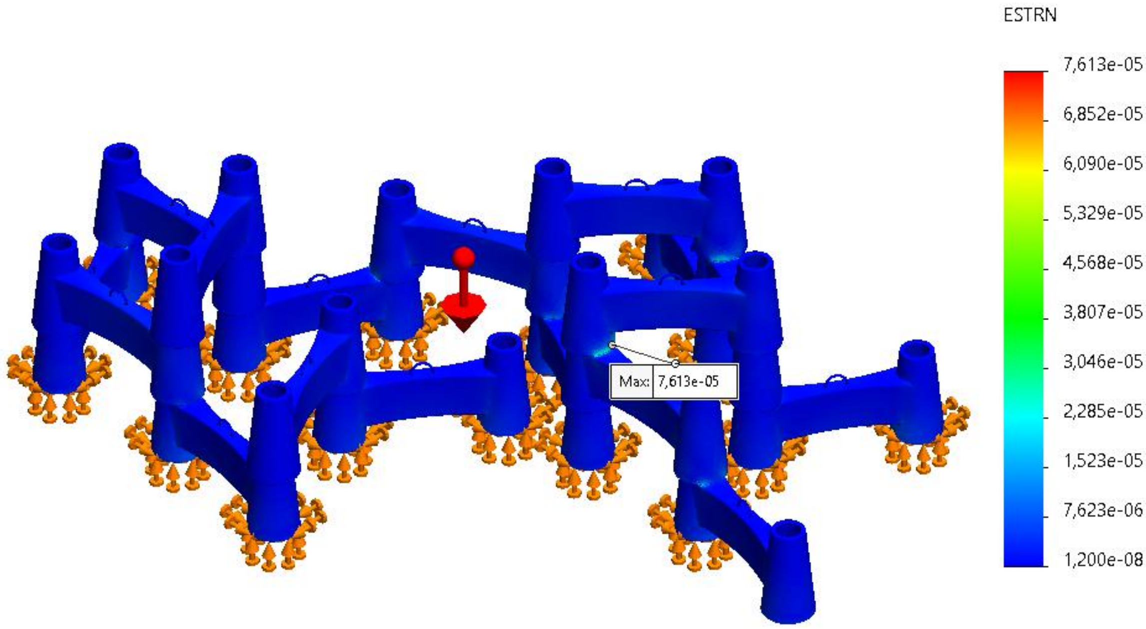
This simulation shows that the full structure remains below the assumed material limit, but the maximum von Mises stress is now closer to the yield strength than in the single-module simulation. The maximum von Mises stress is approximately **4.996 MPa**, while the assumed yield strength is **6.0 MPa**. This means the structure still stays within the allowed stress range, although with a smaller safety margin than before. Most of the structure remains in the blue region, indicating relatively low stress levels overall. The highest stress occurs locally near one of the connections between a vertical support and the connecting beam, which is expected because these transition areas create stress concentrations. Overall, the structure appears acceptable for this load case, but the connection zones are the most important areas to monitor or improve if further optimization is needed.

Displacement test:



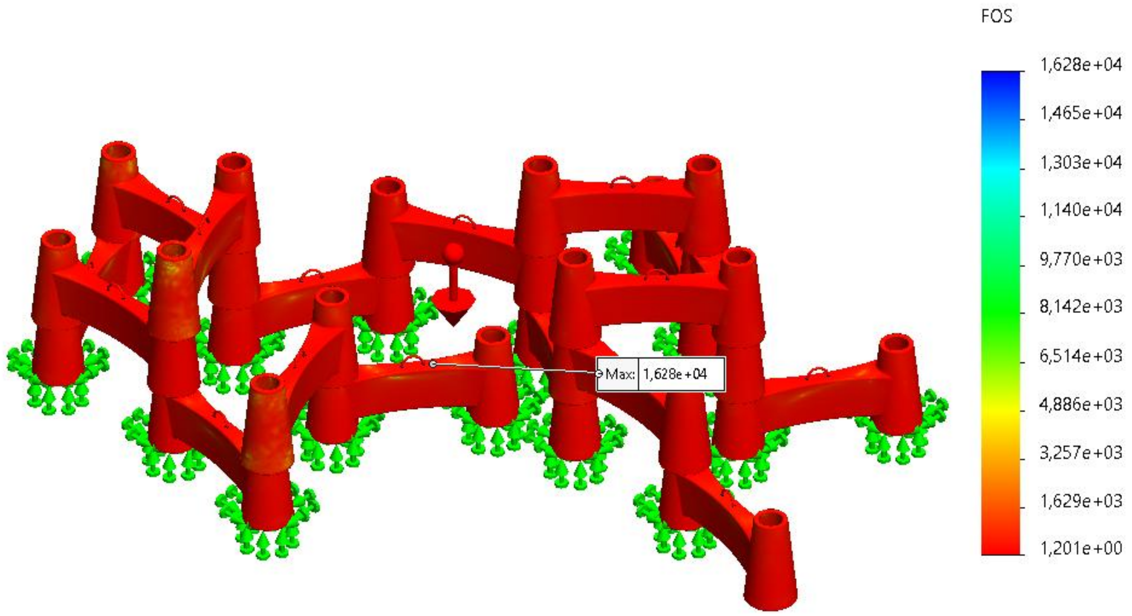
The displacement result of the full structure shows a maximum resultant displacement of approximately **7.05×10^{-2} mm**, or **0.0705 mm**. This is higher than the displacement of the single-module simulation, but it is still a very small deformation. The largest displacement occurs near the upper parts of the vertical supports and around the beam connections, especially close to the area where the load is applied. This is expected because the larger structure has more connected elements and a longer load path, allowing slightly more movement. Overall, the deformation remains limited, so the structure appears sufficiently stiff for this load case.

Strain test:



The strain result for the full structure shows a maximum strain of approximately **7.613×10^{-5}**. This is higher than in the single-module simulation, but it is still a relatively small strain value. The highest strain occurs locally near the connection between a vertical support and a connecting beam, which corresponds with the areas where the highest von Mises stress was also observed. Most of the structure remains in the blue region, indicating that the overall strain level is low. This means that the structure only experiences limited deformation under the applied load case. Overall, the strain result supports the conclusion that the structure behaves in a stable way, although the connection zones remain the most important areas to check or optimize further.

Factor of safety:



The factor of safety result shows that the full structure remains above the assumed material limit, with a **minimum FOS of approximately 1.20**. This means the design is still within the safe range, but the safety margin is smaller than in the single-module simulation. Most of the structure is shown in red because the color scale ranges from **1.20 to 16,280**, so red represents the lower safety factor values rather than immediate failure. The lowest safety factors occur mainly around the connection zones between the vertical supports and the beams, which matches the locations of the highest von Mises stress and strain. Overall, the structure still appears acceptable for this load case, but the connections are the most critical areas and would be the first zones to improve if a larger safety margin is required.

General conclusion:

The simulations show that both the single module and the full structure can withstand the applied underwater load case of approximately **300,128 N/m^2** pressure combined with gravity. For the single module, the maximum von Mises stress was only **0.801 MPa**, compared to the assumed yield strength of **6.0 MPa**, resulting in a high factor of safety of about **7.5**. The displacement and strain were also extremely small, which means the single module behaves very stiffly and safely under the simulated conditions. In the full structure, the maximum von Mises stress increased to **4.996 MPa**, which is closer to the assumed yield strength, and the minimum factor of safety decreased to approximately **1.20**. However, the structure still remains below the material limit. The maximum displacement of **0.0705 mm** and maximum strain of **7.613×10^{-5}** are still very limited, meaning the overall deformation remains small. The most critical areas are consistently found at the connections between the vertical supports and the connecting beams, where stress concentrations occur. Overall, the design appears structurally acceptable for the simplified 30-meter underwater load case, but the connection zones are the most important areas to monitor or improve if a higher safety margin is required. Since the material is concrete-based, it would also be useful to check maximum principal tensile stress, because cracking may occur before traditional yielding.