A statement of intent assures more than 100,000 hydrogen vehicles will enter the market by 2015. A uniform approach for filling the vehicles has been developed and it states that cooling of the hydrogen is needed. For this purpose a test refrigeration facility was built. As the hydrogen is to be delivered at high pressure a heat exchanger was designed and constructed. The paper presents a detailed study of construction of the heat exchanger which has been tested and compared to theory to predict and verify its performance. The method presented by Nellis and Klein for laminar flow in annulus tubes was the most accurate of the methods compared. At low mass flows the calculated result was larger than the measured and at large mass flows the calculated results was lower than the measured. The used approach gives a reasonably accurate calculation for further investigations of cooling hydrogen.