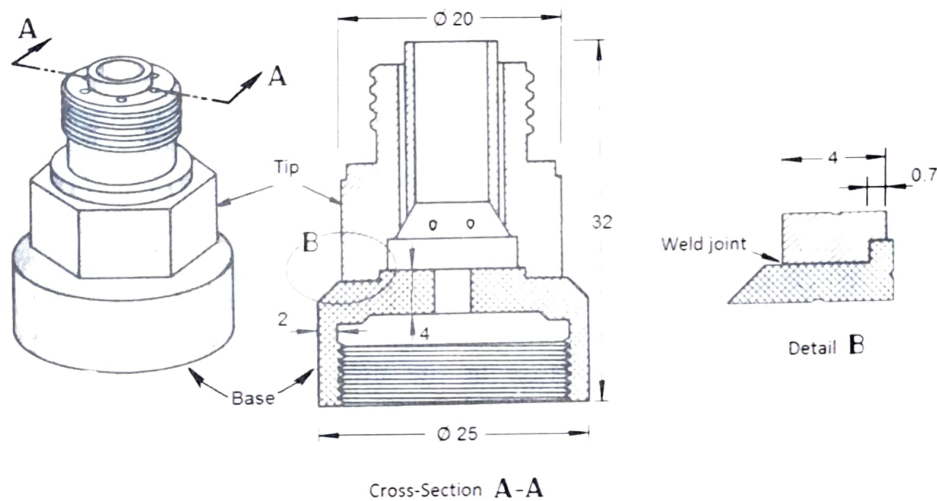


## Case study 7

(Exam: 21st May 2018; MEC-E6002)

Using the welding technology it is intended to produce high-quality, 50 000 “fuel injector head” components to be used in heavy-duty internal combustion engines of ships. As represented in the figure below, the “fuel injector head” components are made by welding two sub-components: “Tip” component and “Base” component. All the production operations are made in indoor conditions and high quality and dimensional accuracy is demanded by the client. Both sub-component are made of AISI 1117 steel and obtained by machining operations from shafts with 30 mm diameter. The weld joint should have full penetration.



Notes:

- The representation of the joint design in Detail B is only one proposal; you should redesign the joint to be in according to the welding process and procedure specification that you decide to implement.
- All units are in “mm”
- Data about the hexagonal shape: length of side,  $a = 11.55$  mm; outer radius,  $R = 11.55$  mm; inner radius,  $r = 10$  mm; perimeter,  $P = 69.3$  mm.

AISI 1117 Composition (%)	C	Ni	Cr	Mn	P	S	Si
Base and Tip	0.33	-	-	1.5	0.04	0.13	1.0

Thermophysical Properties	Young modulus: 205 GPa	Ultimate strength: 475 MPa
Vickers hardness: 143 HV	Elongation: 15%	Yield strength: 400 MPa
Density: 7850 kg/m <sup>3</sup>	Specific heat: 481.0 J/(kg.K)	Thermal cond.: 49.8 W/(m.K)