120 inch steel penstock
Wye Section Outside the tunnel directing the flow from the Olivenhain Reservoir to the power generation and returning the pumped flow from Lake Hodges back to Olivenhain Reservoir.
Dimensions and Baseline Model of the Wye

Pipe wall = 1.25” thick  
Crotch plates = 7.00” thick

Height of crotch plates over the pipe surface is 30.0” at intersection point.
Maximum Principle Stresses in Cylinder and Crotch Plates with 16-inch- diameter Steel Tube
Plastic Strain in Crotch Plate at Bifurcation, Figure 15

- Negligible plastic yielding may occur only at one location in the 7” thick crotch plates (at the bifurcation)
- Adding tube reduces the maximum plastic strain

<table>
<thead>
<tr>
<th></th>
<th>No tube</th>
<th>16” OD tube at intersection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max pl. strain</td>
<td>0.27%</td>
<td>0.135%</td>
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Plastic yielding on upper edge is eliminated by adding the tube.
132 inch-Diameter ECIS & 96 inch Diameter NEIS Sewer Tunnel Projects
132 Inch Diameter ECIS Sewer Tunnel Project
Bechtel Award Presentation

Henry H. Bardakjian, P.E
Consulting Engineer, Glendale, CA. Email: hbardakjian@gmail.com
A Hand-Mined Hole is Dug for the Future Lateral outlet
The Lateral Outlet is Pushed on Rail in the Dug Hole
A Lateral Branch is being Welded to the Main Steel Body
The Lateral is Welded to the Stiffened Steel Main Body in the Tunnel
132 inch X 96 inch Tangential Junction at 30 Degrees Between ECIS and NEIS Projects
96-inch Branch for the Junction Fitting
Thank you for Listening