Natural Gas Regulating Station
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Ensure safe and reliable delivery of natural gas to existing customers while incorporating industry best practices and modern redundant safety features.

STATION REQUIREMENTS
- Filter / Strainer
- Over pressure protection (OPP)
- Bypass methods at every step
- Heater
- HP Rotary Meter
- Super Monitor
- SCADA
- Automated Fire Valve

DESIGN PARAMETERS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>VALUE</th>
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<tbody>
<tr>
<td>MAOP</td>
<td>492 PSIG</td>
</tr>
<tr>
<td>Maximum flow rate (20% growth)</td>
<td>210 MSCFH</td>
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<tr>
<td>Maximum design velocity</td>
<td>80 FPS</td>
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<tr>
<td>Maximum percentage of pipe yield strength</td>
<td>20% SMYS</td>
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EQUATIONS

- General Flow Equation:
  \[ Q = \frac{f \cdot T \cdot \sqrt{L}}{P^3} \]
- Pipe Velocity Equation (FPS):
  \[ v = 0.05093 \left( \frac{Q}{P_{in} + P_{out}} \right) \frac{D_{in} - D_{out}}{D_{out}} \]
- Temperature, \( T \)
- Flow, \( Q \)
- Wall thickness, \( t \)
- Length, \( L \)
- ID, \( D_{in} \)
- OD, \( D_{out} \)

\[ \Delta T_{preheat} = Q \cdot \rho \cdot C_{p} \left( \frac{P_{in} - P_{out} + T_{out} - T_{in}}{\Delta T_{in}} \right) + \left( 1 - \frac{\eta}{100} \right) \]

\[ \Delta T_{preheat} \] Amount of “output” (BTU/hr.) required from heater

STATION COMPONENTS AND COSTS

- Ball valve 4", Class 300, W/C, air operated.
- Ball valve 5", Class 300, W/C, air operated.
- Ball valve 5", Class 350, W/C, air operated.
- HPRotary Meter 1", Class 300
- Grove 9000T, 1", Class 300
- Grove 9000T, 1", Class 300
- Tee Strainer 4"
- HP Rotary Meter 1.5"/300/CGA with indicator
- Peco Filter Separation 4" R/V
- 1" inlet reducing pipe
- 1" outlet reducing pipe
- 1" ball valve 4" class 300 W/C w/ basket actuator valve
- 1" relief valve - Moyno
- 1" Automated Fire Valve
- Gas detector MSA/GM X500 Gas Monitor

TERI Vertical Indirect-Fired Water Bath Heaters

Example Calculation Case: 6" Steel Extra Strength
- Model showing pipeline velocity less than 80 FPS with environmental/initial conditions
- Shows calculated friction factors and Reynolds number

THE STATION’S FUTURE
- Project Kickoff
- Final Approvals
- Design Phase
- Cost Estimating
- Engineering Contractor Deliverables
- Permitting Phase
- Construction Phase
- As Built Phase
- Documentation Phase
- Maintenance and Longevity

Station Classifications:
- Pipeline and Hazardous Materials Safety Administration (PHMSA), Department of Transportation (DOT)
- Location: Class 4
- National Electrical Code Hazardous Location: Class 1, Division 1

Terms to know:
- GSGT: Granite State Gas Transmission
- OPP: Over pressure protection
- MAOP: Maximum allowable operating pressure
- SMYS: Specified minimum yield strength
- CFR: Code of federal regulations
- PSIG: Pounds per square inch gauge (unit of pressure)
- BTU: British thermal units (measure of heat)
- SCADA: Supervisory control and data acquisition

PROJECT SPONSOR
Unitil provides natural gas and electricity to regions of Maine, New Hampshire, and Massachusetts from its generation, transmission, and distribution to customers.

PROJECT SCOPE
The Ocean Road Station redesign project encompasses a comprehensive overhaul of the existing legacy metering and regulation station located in Greenland, NH. The project aims to address critical issues such as significant icing due to the Joule-Thomson effect, lack of tertiary and quaternary over-pressure protection, nearing full capacity of existing components, security concerns, among other issues.

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Building

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Diagram:
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Diagram:
- TERI Vertical Indirect-Fired Water Bath Heaters
- HP Moyno Flowmax Super Monitor
- Grove 900 TE Regulator

Diagram:
- Diagram of the regulating station with various components and flow paths.

Diagram:
- Diagram showing the location of the regulating station within the broader network, including connections to other stations and critical infrastructure.

Diagram:
- Diagram illustrating the design parameters and values, including MAOP, flow rates, and velocity.

Diagram:
- Diagram highlighting the station components and costs, with detailed breakdowns and pricing information.

Diagram:
- Diagram depicting the station’s future phases and milestones, including project kickoff, final approvals, design phase, cost estimating, and more.

Diagram:
- Diagram showing the station’s past and current status, including the existing legacy components and the need for comprehensive overhaul.

Diagram:
- Diagram explaining the objectives of the project, focusing on safe and reliable delivery of natural gas while incorporating industry best practices and modern redundant safety features.

Diagram:
- Diagram illustrating the equations used for calculating pipeline velocity, temperature, and other critical parameters.

Diagram:
- Diagram showing the station’s components and systems, including filter, strainer, over pressure protection, and various valves and monitors.

Diagram:
- Diagram detailing the station’s future phases and the timeline for project completion, from kickoff to maintenance and longevity.

Diagram:
- Diagram showing the station’s classification and location, including the hazardous location code and pipeline safety administration.