

# Pipe Hydrotest Stress Analysis Report

Von Mises Stress & Minimum Bending Radius Calculation

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PROJECT NAME

**Demo - Case #1**

CLIENT

**ABC Pipeline**

CALCULATED BY

**John Smith, PE**

DATE

**June 29, 2026**

# Pipe Hydrotest Stress Analysis Report

## EXECUTIVE SUMMARY

|                         |               |
|-------------------------|---------------|
| Minimum Bending Radius: | 1243.5 ft     |
| Hoop Stress Level:      | 79.2% of SMYS |
| Von Mises Target:       | 63000 psi     |

## 1. INPUT PARAMETERS

### Pipe Properties

| Parameter            | Value  | Unit   |
|----------------------|--------|--------|
| Nominal Diameter     | 42     | inches |
| Outside Diameter (D) | 42.000 | inches |
| Wall Thickness (t)   | 0.720  | inches |
| Pipe Grade           | X70    | -      |
| SMYS                 | 70000  | psi    |
| Safety Factor        | 0.90   | -      |

### Test Conditions

| Parameter          | Value | Unit |
|--------------------|-------|------|
| Hydrotest Pressure | 1900  | psig |
| D/t Ratio          | 58.3  | -    |

## 2. STRESS CALCULATIONS

### Pressure-Induced Stresses

| Stress Component                       | Value | Unit |
|----------------------------------------|-------|------|
| Hoop Stress ( $\sigma_{\theta}$ )      | 55417 | psi  |
| Longitudinal Stress ( $\sigma_{L,p}$ ) | 27708 | psi  |
| Hoop Stress % SMYS                     | 79.2% | -    |

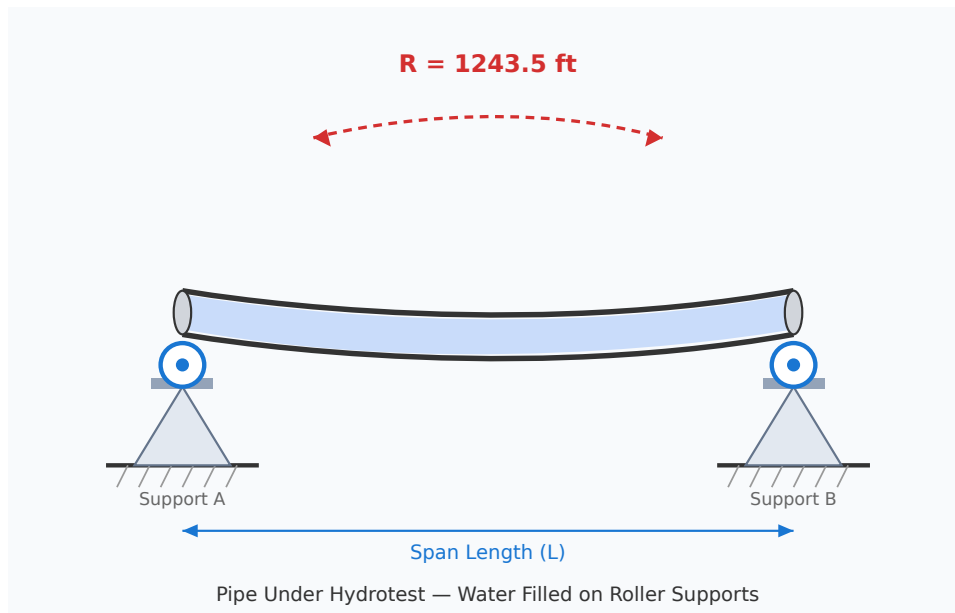
### Von Mises Analysis

| Parameter                                | Value | Unit |
|------------------------------------------|-------|------|
| Target Von Mises ( $S_y$ )               | 63000 | psi  |
| Allowable Von Mises (% SMYS)             | 90%   | -    |
| Max Bending Stress ( $\sigma_b$ )        | 40814 | psi  |
| Total Longitudinal Stress ( $\sigma_L$ ) | 68522 | psi  |

#### FINAL RESULTS

|                                  |            |
|----------------------------------|------------|
| Minimum Bending Radius:          | 1243.5 ft  |
| Minimum Radius (inches):         | 14921.5 in |
| Minimum Radius (pipe diameters): | 355.3 x D  |
| Bending Strain ( $\epsilon_b$ ): | 0.141%     |

### 3. PIPE CONFIGURATION



### 4. RECOMMENDATIONS

#### Bending Guidelines

- Minimum centerline radius: 1243.5 ft
- Ensures von Mises stress  $\leq 90\%$  SMYS
- Monitor pipe ovality during bending

#### Quality Control

- Verify pipe properties before bending
- Document actual radii achieved
- Perform NDT inspection as required

#### Certification

Analysis performed using von Mises stress criterion. Minimum radius of 1243.5 ft ensures equivalent stress remains below 90% of SMYS.