

# ASTM A694 F42/F46/F52/F60/F65 Specification

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ASTM A694 covers **forged carbon and alloy steel pipe flanges, fittings, valves, and parts** intended for **high-pressure transmission service**. These components are typically used in **oil and gas pipelines**.

The specification includes several grades based on **minimum yield strength**, such as:

## Grade Minimum Yield Strength

F42	42,000 psi (290 MPa)
F46	46,000 psi (315 MPa)
F48	48,000 psi (330 MPa)
F52	52,000 psi (360 MPa)
F56	56,000 psi (385 MPa)
F60	60,000 psi (415 MPa)
F65	65,000 psi (450 MPa)
F70	70,000 psi (485 MPa)

## Heat Treatment

- **Mandatory for all grades** to ensure proper mechanical properties.
- **Accepted methods:**
  - Normalization
  - Quenching and Tempering
  - Normalizing and Tempering
  -

## Chemical Composition Requirement

**TABLE 2 Chemical Requirements**

	Composition, %
	Heat Analysis
Carbon, max	0.30
Manganese, max	1.60
Phosphorus, max	0.025
Sulfur, max	0.025
Silicon	0.15–0.35
Copper <sup>A</sup>	
Nickel <sup>A</sup>	
Chromium <sup>A</sup>	
Molybdenum <sup>A</sup>	
Vanadium <sup>A</sup>	
Columbium (Niobium) <sup>A</sup>	
Boron <sup>A</sup>	

## Testing Requirements

### 1. Mechanical Testing

- Tensile test (per heat)
- Impact test (if required)

### 2. Impact Testing (Charpy V-Notch)

- Required if the service temperature or customer specs demand it.
- Typically tested at sub-zero temperatures (e.g., -46°C/-50°F).

### 3. Chemical Analysis

- Required for each heat.

### 4. Nondestructive Testing

- **Visual inspection** mandatory.
- UT, MPI, or LPT as required by purchaser

## Marking Requirements

Each component must be marked with:

- Manufacturer's name or trademark
- Grade (e.g., F65)
- Heat number
- Size and class
- ASTM A694

## Referenced Standards

- **ASTM A961** - General requirements for steel flanges and forgings
- **ASTM A370** - Mechanical testing procedures
- **ASME B16.5 / B16.47** - Dimensions for flanges (if applicable)

**Product available:**

ASTM A694 applies to **forged** components, including:

1. **Pipe Flanges**
  - Weld neck flanges
  - Slip-on flanges
  - Blind flanges
  - Socket weld flanges
  - Lap joint flanges
  - Threaded flanges
  - Orifice flanges
  - Long weld neck flanges
2. **Fittings**
  - Forged elbows
  - Tees
  - Reducers
  - Caps
  - Crosses
  - Swage nipples
  - Branch outlets (olets)