WahlcoMetroflex, Inc.

Metallic Bellows

WahlcoMetroflex is a world leader in the development and manufacture of cold-rolled, thin-walled, high performance convoluted expansion joints.

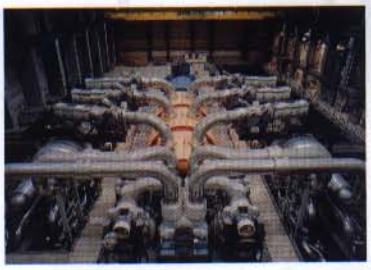
WahlcoMetroflex expansion joints are used to accommodate the movement of pressurized piping systems caused by thermal growth, pressure contraction, machine vibration, seismic disturbances, and installation irregularities. The bellows carry numerous types of media, including steam, emission gases, water, acids, alkalies, and hydrocarbons.

EXPANSION JOINTS FOR PRESSURIZED PIPEWORK

APPLICATIONS:

- Fossil Fuel Power Generation
- Gas Turbines
- Petroleum Refining
- Chemical Processing
- Hot Metal Industries
- Ship Building
- District Heating and Steam Distribution Systems
- HVAC Equipment
- Pulp and Paper Processing
- Heat Exchangers
- Industrial Piping Systems

29 Lexington Street, Lewiston, Maine 04240 USA ▪ Telephone (207) 784-2338 ▪ Fax (207) 784-1338



Hot and cold reheat pipework and expansion joints.

WahlcoMetroflex's custom engineered hinged metal expansion joint.

Stainless steel tubes prior to bellows forming.

ENGINEERED ACCOMMODATION OF PIPEWORK MOVEMENT

BELLOWS FOR ANY ENVIRONMENT

WahlcoMetroflex bellows are designed to operate under very severe temperatures and pressures–from absolute zero to 1,500°F and full vacuum to 3,000 psig, depending upon the bellows' diameter. Bellow thicknesses range from 0.005" to 0.250" for single-ply, and multi-ply thicknesses of up to four ply, from 0.005" to a total multi-ply thickness of 0.250", depending upon the diameter of the bellows.

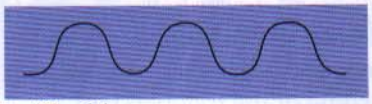
INFINITE INCREMENTAL SIZES

Bellows can be made from 0.5" to 20' and larger in diameter, with *standard* bellows ranging from 1" to 72" in diameter. Wahlco Metroflex's unique convolution-forming processes can produce bellows at non-standard (incremental) diameters.

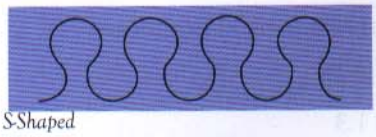
DURABLE, CORROSION-RESISTANT MATERIALS FOR ELEVATED TEMPERATURES

WahlcoMetroflex's expansion joint engineers select the appropriate bellows materials for each individual application, based on required strength, operating temperature, and corrosion resistance. Standard bellows materials is 321 stainless steel; other available alloys include:

- Selected 300 Series Stainless Steels
- Incoloy® 800, 800H and 825
- Alloy 718 and X750
- Monel® 400
- Inconel® 600 and 625
- Nimonic® 75 and 80A
- Hastelloy® B and C Series
- Titanium
- Aluminum

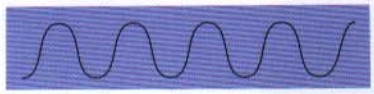


Semi-Toroidal



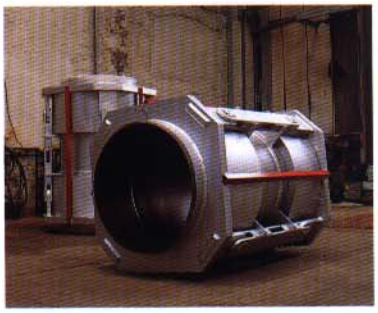
S-Shaped

Parallel-Side



Open Convolution

48" diameter pressure-balanced joint for cold reheat pipe.



36" diameter double articulated unit for cold reheat pipe.

CONVOLUTIONS AVAILABLE

Convolutions are available in a wide range of profiles. On the left are illustrations of some of the profiles used in various *WahlcoMetroflex* bellows.

STYLES OF EXPANSION JOINTS

WahlcoMetroflex engineers will determine the most appropriate and economical expansion joint style and design for a given application.

- **End Attachments:** Bellows assemblies can have butt weld ends or flanged ends, as well as customized end fittings to meet specific customer needs.
- **Number of Bellows Sets:** Single, double and multiple bellows sets are available.
- **Bellows Shapes:** Round, rectangular and other special shapes.
- **Styles of Expansion Joints:** *WahlcoMetroflex* offers many expansion joint styles, including:

  Axial—Single or double bellows sets, with or without anchor bases.

  Universal—Single or double tied units, with two or more tie rods.

  Articulated—Single or double hinged and single or double Gimbal.

  Pressure-Balanced—Three different configurations: In-Line, Elbow or Tee.

  Applied-Pressure—Internal or external to bellows.

Pantographic linkages for articulated or universally-tied expansion joints are also available, as are limit rods, liners, covers and reinforcing rings.

When required, leak detection devices are available for sensing leaks either between the various plies or between concentric bellows.

Finite element analysis performed on load-bearing structures for a restrained expansion joint.

COMPLETE METALLURGICAL CAPABILITIES

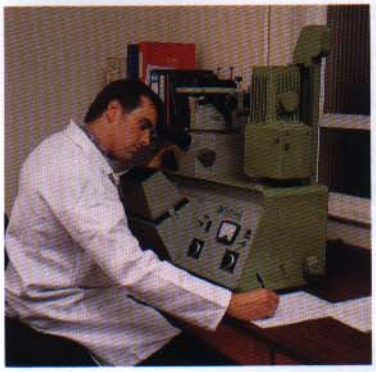
WahlcoMetroflex's comprehensive Metallurgical Laboratory works closely with the Research & Development and Bellows Performance Analysis Departments.

INTEGRATED MANUFACTURING FOR SPEEDY TURNAROUND

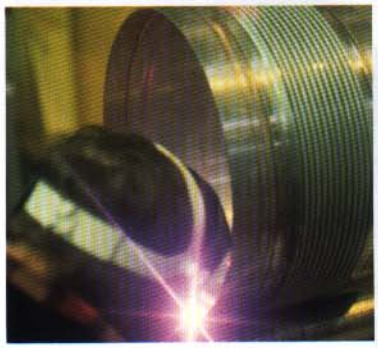
All materials can be welded, expanded, formed, tested and painted in house, enabling *WahlcoMetroflex* to meet the most stringent delivery schedules while maintaining the industry's highest quality.

WahlcoMetroflex has refined its auto-TIG welding process to create longitudinal butt welds that are of high integrity as verified by non-destructive testing (NDT). The resulting welds match the parent metal strength, with the smallest possible heat-affected zone.

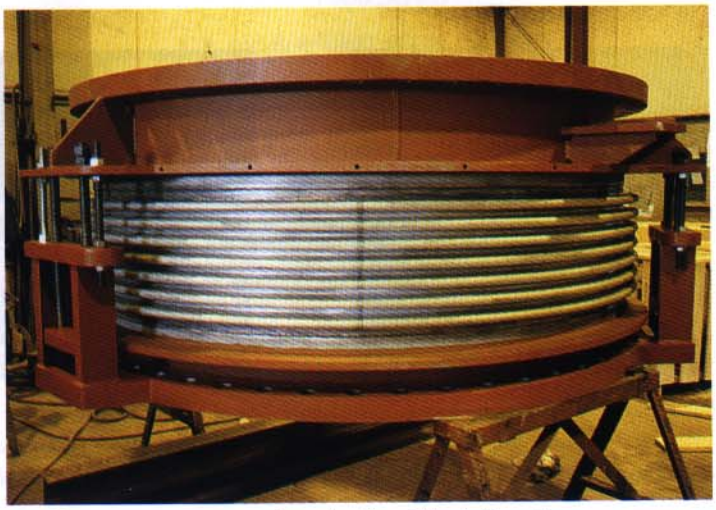
WahlcoMetroflex designs much of its own tooling, giving unrivaled metal-forming capabilities. Bellows convolutions are formed either hydraulically or mechanically on specially-built forming machines, offering an exceptionally wide range of convolution profiles.



A technician using a projection microscope to verify the acceptance standards of a bellows component.



Precision TIG welding of bellows to carbon steel pipe ends.



Hot blast main expansion joints for steel mill in Ashland, Kentucky.

WahlcoMetroflex has a full range of testing available.

EXACTING COMPLIANCE TO NATIONAL & INTERNATIONAL STANDARDS

WahlcoMetroflex is a member of and all products are manufactured and tested to meet the rigorous guidelines set forth by the Expansion Joint Manufacturers Association (EJMA). Comprehensive testing and inspection programs include:

- Materials testing, identification and documentation.
- Non-destructive testing by radiographic and liquid penetrant examination.
- Leak detection by hydrostatic and pneumatic pressure testing.
- Base material and weld deposit analysis by hardness testing.
- Bellows spring characteristics verification by spring rate testing (load/deflection testing).
- Life expectancy verification by extensive mechanical deflection testing.

WahlcoMetroflex Quality Systems are independently assessed and fully approved for both the design and manufacture of bellows.

Radiographic examination of circumferential butt welds in a typical pipework system.

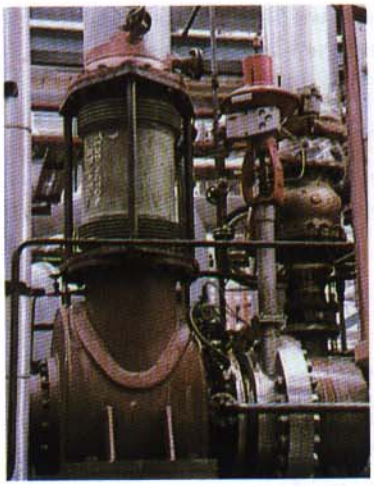
Double tied bellows for petroleum tank settlement. The bellows accommodate tank settlement and other vertical or lateral movements, minimizing stress on both the tank walls and adjoining pipework.

Tuyere stock expansion joints for a blast furnace. Iron and steel industry applications also include hot and cold blast mains, gas mains and fume extraction systems.

WahlcoMetroflex custom engineered tandem metal expansion joint for an overseas petroleum company.

Quality systems for *WahlcoMetroflex* bellows comply with national and international standards of design and manufacture. Some of these standards are listed below, together with some of the independent inspection authorities:

- American Society of Mechanical Engineers
- ASME Section VIII & IX
- ANSI B31.1 and B3 1.3



A petrochemical plant using a multi-tied expansion joint to absorb pipework deflections and minimize stresses.

Complex expansion joint systems for boiler feed water pump turbine exhausts in large electric utilities.

WahlcoMetroflex, Inc.

29 Lexington Street, Lewiston, Maine 04240 USA ▪ Phone (207) 784-2338 ▪ Fax (207) 784-1338
800-272-6652