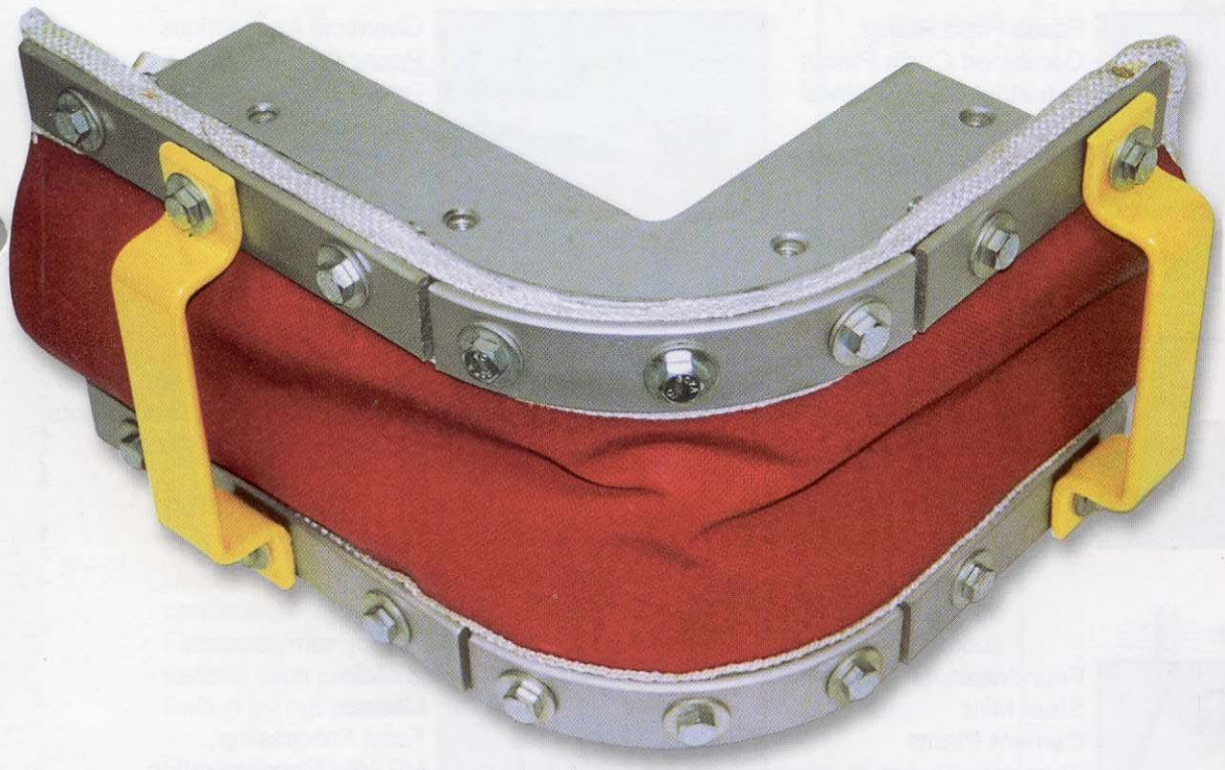
UNAFLEX®

"Excellence In Manufacturing"



FABRIC

THERMA*FLEX
NON-METALLIC DUCTING
EXPANSION JOINTS

INTRODUCTION TO "THERMA*FLEX" EXPANSION JOINTS

THERMA*FLEX Expansion Joints are Non-Metallic Flue Duct Expansion Joints or flexible connectors, which when properly designed, provide stress relief for piping and ducting systems by absorbing thermal growth & shock, isolating mechanical vibration and allowing for misalignments.

Flue duct expansion joints are custom engineered products designed to handle low pressure(±5psig) applications with temperatures from -100° F to +2000° F. The expansion joints are manufactured using innovative non-metallic materials and designs.

Unaflex is one of the country's leading Expansion Joint Manufacturers. Since 1972 Unaflex has been dedicated to state of the art technologies combined with industry proven processes. In the 1990's Unaflex has become the industry leader in "Combined Technologies" for the Expansion Joint and Flexible Hose Industries.

Unaflex is a full service Engineering and Manufacturing Company dedicated to providing flexible solutions. Our capabilities include: Rubber, Metal, Fabric and Teflon® Expansion Joint Manufacturing, Laboratory Testing and Analysis and Field Service.

INDUSTRIES AND APPLICATIONS

Power Generation:

Fossil Fired Plants
Combined Cycle Plants
Industrial Gas Turbines
CFBs
(Fluidized Bed Boilers)
Nuclear Plants

Pulp & Paper Plants:

Chemical Applications
Paper Processing
Power and Recovery Boilers
Fans/ Blowers

Petrochemical:

Byproduct Incineration:
Elevated Temperatures
(>2000° F)
Severe Chemical Attack
Refineries

Environmental Applications:

SCR & NOx Systems
Waste Water Treatment Plants
Waste & Recycling Incinerators
Stack & Chimney Seals
CEMs

Heavy Industrial:

Foundries
Steel Mills
Cement Plants
Aluminum Plants
Kilns & Smelters

Others:

HVAC
Marine
Food Processing
HRSG / Congeneration
Chemical Processing

DESIGN ADVANTAGES OF NON-METALLIC DUCTING EXPANSION JOINTS

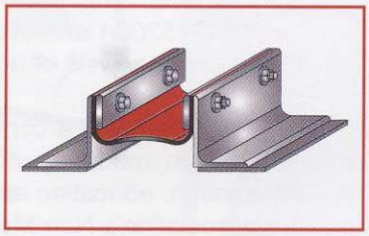
1. Large movement capability / Multi-plane movements.
2. Corrosion / Chemical Resistance
3. Range of Design Temperature Capability (-110° F to +2000° F)
4. Negligible Spring Rates / Loads
5. Vibration Dampening & Sound Attenuation
6. Lower Overall Costs (Design, Installation, Replacement & Repair)
7. Easily Repairable / Installable
8. High Cycle Life
9. Unique Application Solutions

APPLICATIONS

Industrial applications can be separated into general categories based on the media composition (Air or Gas) and temperature. The following section is designed to aid in the selection of the appropriate expansion joint for the specific application range. All plants are different, therefore the service locations and temperatures may vary. This section is only a guide and should be confirmed with a Unaflex Engineer.

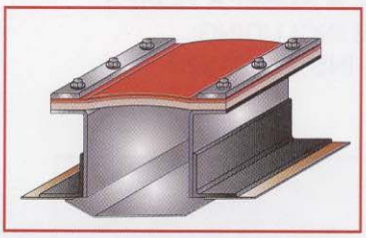
AMBIENT AIR SERVICES (-40° F to 150° F)

Ambient temperature clean air without particulate or chemicals to damage the flexible element. Expansion Joint is used frequently for vibration and sound attenuation from fan equipment.



Locations: FD Fan Inlet / Outlet
Service Air Intakes
Primary Air Fan to Air Heater
Primary Air to Recovery Boiler

A Unaflex integrally flanged elastomeric joint is suggested, using either the THERMA*FLEX or MIGHTY SPAN styles. Neoprene or EPDM single layer belts are frequently used.



HOT AIR SERVICES (500° F to 800° F)

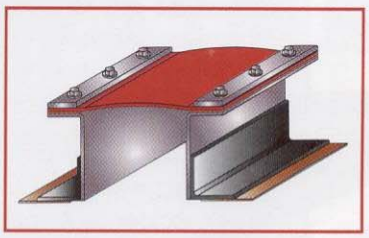
Clean air after coming in contact with hot flue gases at the Air Pre-Heater where temperatures are elevated with minimal particulate and / or gas carryover. Expansion joint will see thermal movements and vibration. Elevated temperatures require a composite flexible element and a flow liner.

Locations: Air Heater Air Outlet
Over Fire Air Fans
Secondary Air Fan
Mill Air

A THERMA*FLEX flat composite belt with a bolt or weld-in frame design and flow liner is suggested. The weld-in outboard angle frame design with field welded flow liner **(TWCP600VIFL)** is shown.

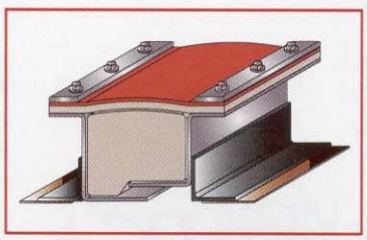
LOW TO MODERATE TEMPERATURE FLUE GAS SERVICES (150° F to 600° F)

Flue gas which has passed through an air preheater and dust collector to reduce the temperature and particulate levels. Flue gas may cycle near the dew point where condensation can occur and chemicals are present. Expansion joint may see thermal movements, vibration and chemical attack.



Locations: Precip. Outlet
I.D. Fan Inlet / Outlet
Scrubber Inlet / Outlet
HRSG Outlet
Reheater Inlet / Outlet

A Unaflex single layer belt with chemical barrier is suggested in either integrally flanged or flat belt type. Such as the THERMA*FLEX weld-in outboard angle frame design and Teflon® coated single layer belt with gas film layer **(TWFPR500TA)** shown.

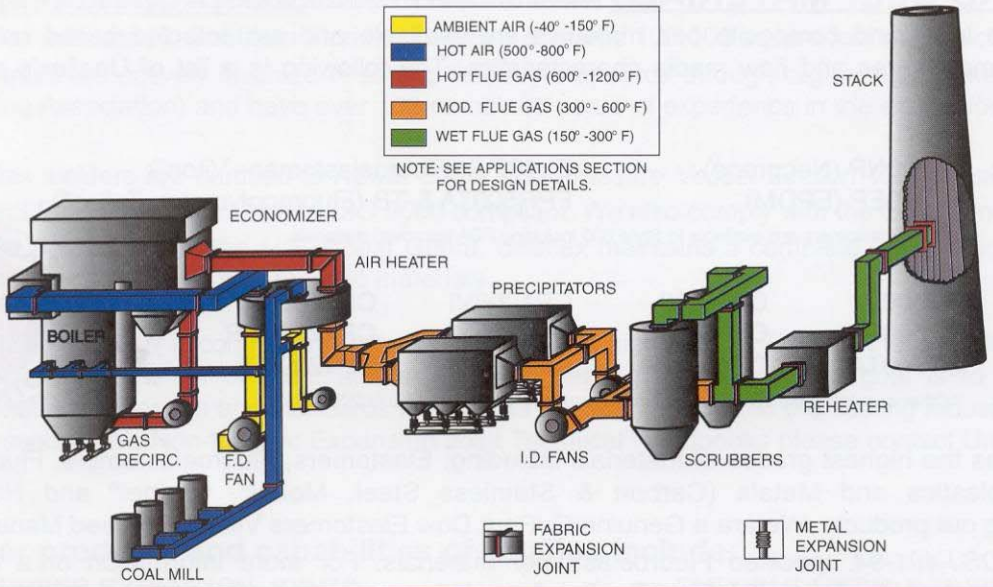


HOT FLUE GAS SERVICES (600° F to 1200° F)

Flue gas directly after combustion stage at elevated temperatures with possible particulate present. Expansion Joint is used for possible large thermal movements at elevated temperatures.

Locations: Economizer Outlet
Cyclone Inlet / Outlet
Precip. Inlet
Recovery Boiler Outlet
Air Heater Gas Inlet / Outlet
Gas Recirculation System

THERMA*FLEX high temperature composite flat belt style with setback frames, cavity pillow and flow liners is suggested. The standard "Z" frame design with telescoping flow liners **(ZZWCP1000FPRP** shown**)** or "J" frame design with shop liner are two designs frequently used in these applications.



SPECIAL APPLICATIONS

Unaflex's expertise extends to applications where service conditions require special designs / considerations such as:

- Gas Turbine Exhaust & HRSG EJs - Large Axial Movements, Thermal Shock and Radial Growth
- Cyclone Inlet / Outlet & Loopseals at CFBs - High Flow Velocity or Turbulence and Elevated Temperatures
- Stack & Penetration Seals (HRSG) - Lateral Movement and Field Installation / Splicing
- Cement Plant Applications - High Particulate Loading and Cementous Media
- Pulp & Paper Plants - Severe Chemical Attack and Vibration
- Petrochemical Plant - Elevated Temperatures and Chemical Attack
- Fabric wrap of Existing Metal Expansion Joint - Quick Inexpensive Replacement / Possible on-line repair

OUR CUSTOMERS

INDUSTRIAL

Aalborg Keystone
Alstom Energy Systems
Bath Iron Works
Bethlehem Steel Company
Chrysler Motor Corp.
Champion International
Dow Chemical Corporation
E.I. DuPont Company
General Electric
General Dynamics
Ingalls Shipbuilding
LaFarge Cement
Mitsubishi
Medusa Cement
Mobile Oil Company
Monsanto Chemical Co.
Niro
Nooter/Eriksen
Shell Oil Company
Union Camp
Union Carbide & Chemical
U.S. Steel Company
Vogt-Nem
Weyerhauser Corporation
Wheelabrator
Westvaco Corp.

ENGINEERING & CONSTRUCTION

ABB
Bechtel Corporation
Black & Veatch
Babcock & Wilcox
Dorr-Oliver Company
Fluor Daniel
Foster Wheeler
ICF Kaiser
Kvaerner Metals
Parsons
Raytheon
Sargent & Lundy
Stone & Webster

POWER GENERATION

American Electric Power
CalEnergy Co.
Cincinnati Gas & Electric
Cogentrix
Consolidated Edison Co. of N.Y.
Commonwealth Edison
Detroit Edison
Florida Power Corp.
Florida Power & Light
Indianapolis Power & Light
Kentucky Utilities
Potomac Electric Power Co.
Public Service Co. of Colorado
Mississippi Power & Light
N.Y. State Elec. & Gas Corp.
South Carolina Electric & Gas
Tampa Electric Company
Tucson Electric Light & Power
T.V.A.
Virginia Electric Power Co.

STANDARD BELT MATERIALS (Material code refers to Continuous Operating Temperature Limit in degrees F.)

Various single layer and composite belt materials are available and are selected based on the specific application temperatures and flow media characteristics. The following is a list of Unaflex's standard belt designs.

Single Layer: (EL or FPR)	EL200NP (Neoprene)	EL400VI (Fluoroelastomer - Viton®)
	EL300EP (EPDM)	FPR500TA & TB (Fluoropolymers - Teflon®)

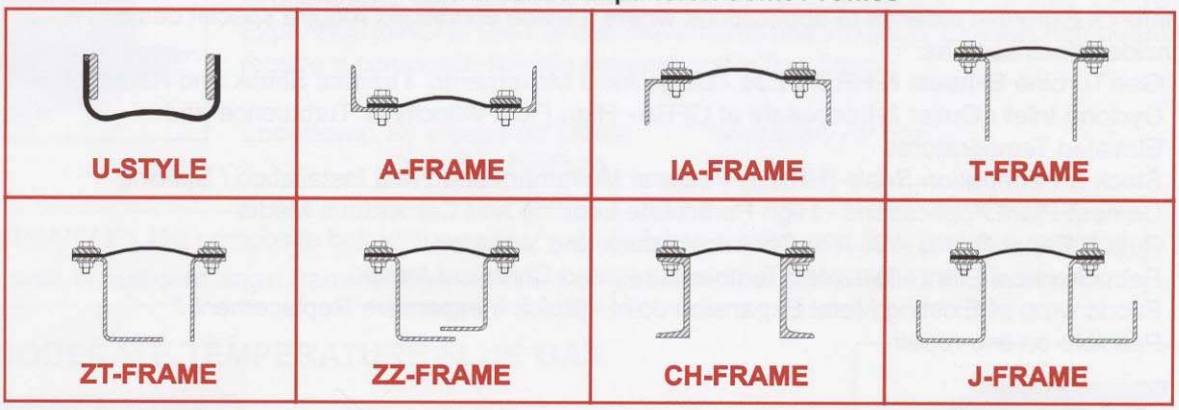
**Other elastomers are available in Style 600 including FDA approved materials.

Composite: (CP)	CP500VI	CP800VI	CP1000VI	CP1200SI
	CP500SI	CP800SI	CP1000SI	CP1200FPR
	CP700TA	CP1000TA	CP1000FPR	CP1200GT

**Other composite buildups and covers are available per request up to 2000°F.

Unaflex utilizes the highest grades of materials including: Elastomers, Fluoroelastomers, Fluoropolymers, Fluoroelastoplastics and Metals (Carbon & Stainless Steel, Monel®, Inconel® and Hastelloy®) in manufacturing our products. We are a Genuine DuPont Dow Elastomers Viton® Licensed Manufacturer and supply *FSA-DSJ-401-94* specified Fluoroelastomer materials. For more information or a copy of this specification contact Unaflex or the Fluid Sealing Association.

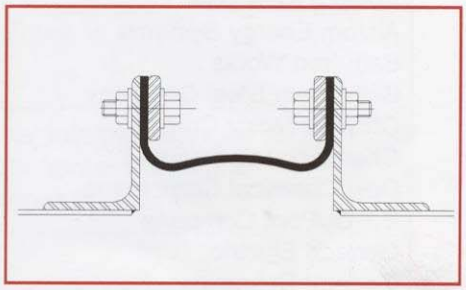
Standard Non-Metallic Expansion Joint Profiles



DESIGN CONFIGURATIONS

INTEGRALLY FLANGED / "U"-TYPE

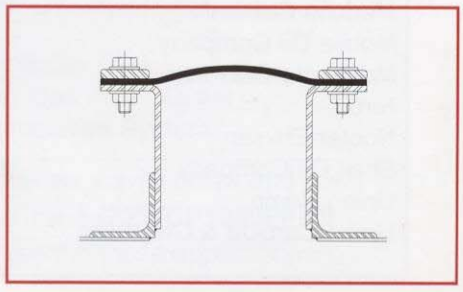
The single layer belt can be provided as either a fully hand molded Unaflex "MIGHTY SPAN" Style 600 Elastomeric expansion joint or a continuous molded corner THERMA*FLEX Style Elastomeric or Fluoropolymer joint. Style 600 joints are available with or without various arch profiles molded into the body. The service temperature is limited by the material rating.



U-type joints are used frequently in fan applications due to their minimal hardware requirements and vibration / sound attenuation.

FLAT BELT TYPE

Available in single layer or composite belts mounted parallel to the duct on attachment frames. The frames may be either bolted to mating flanges or welded directly to the ductwork. See above for standard frame profiles.



Flat belt types are commonly used in high temperature applications and where a setback is recommended or required. This configuration can be designed to readily accept various accessories such as telescoping or floating flow liners, cavity pillows and fly ash seals.

COMPANY PROFILE

Unaflex is located in Southern Florida in a newly acquired 100,000 square foot manufacturing facility. Our personnel are actively involved in setting industry standards through organizations like the **FSA** (Fluid Sealing Association) and have over 100 combined years of experience in the expansion joint industry.

Unaflex welders are certified to *ASME Boiler and Pressure Vessel Section VIII, Division I.* Our Quality Control Program is rigorous and *ISO 9000* compliant. We also comply with the Government requirements for *MIL-I-45208A* and the *U.S. Coast Guard.* Unaflex maintains a complete Full Service Laboratory for testing and analysis of non-metallic materials.

Unaflex has been a contributing member of the FSA since 1974. The FSA is the International Trade Association made up of manufacturers of fluid sealing products. Their goal is to be a source of information, education and standards for the end user in reference to the sealing industry. For a copy of the association's Non-Metallic Expansion Joint Technical Handbooks please contact Unaflex or the FSA directly.

Other products and capabilities of Unaflex include:

- RUBBER EXPANSION JOINTS
- METAL BELLOWS EXPANSION JOINTS
- TEFLON® & TEFLON® LINED EXPANSION JTS
- FLEXIBLE METAL & RUBBER HOSES
- FIELD SERVICES INCLUDING: SUPERVISION & INSTALLATION

WARRANTY

Unaflex warrants that our engineered products are to be manufactured from all new and unused materials, to be free from defects in material and workmanship, and to be of sufficient design and capabilities to meet the requirements of the specified operating conditions, for a period of 12 months after the product has been placed in service, or 18 months from date of shipment, whichever comes first.

Except as set forth, no other warranty, either expressed or implied, is made by UNAFLEX. Our maximum liability is limited to the total purchase price of the equipment found to be defective or, at UNAFLEX's option, product will be repaired or replaced free of charge including transportation charges but not cost of removal or installation.

Correction of defects shall constitute UNAFLEX's sole and exclusive responsibility to purchaser under this warranty, and the supplier shall in no event be liable for injuries to persons, property, or direct, incidental or consequential damages caused by use of this product.

UNAFLEX shall not be liable if the products are used for any purposes or under any conditions beyond those originally specified, including modification, repair, or improper installation by anyone other than an authorized UNAFLEX agent, or damage due to misuse or negligence.

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"Excellence In Manufacturing"

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FLUID SEALING ASSOCIATION FSA