US BELLOWS® EXPANSION JOINTS
Member of EJMA
A Piping Technology Company

Battery Manufacturing Plant Case Study

US Bellows Delivers 200+ Expansion Joints, Including Unique Super U-Loops, in Record Time

BACKGROUND

A large-scale battery manufacturing facility required a comprehensive piping solution across multiple utility systems, including chilled water, steam, nitrogen, compressed air and condensate. The project spanned two major production buildings and involved extensive coordination across engineering, procurement, and construction teams.

Given the size and complexity of the facility, the piping systems needed to accommodate significant thermal growth, lateral deflection, and seismic movement, all within tight layout constraints and an aggressive construction schedule.

Piping Technology & Products and its subsidiary, US Bellows, were engaged to provide a fully engineered expansion joint and pipe support solution to meet these demands.

PROBLEM

Traditional approaches using pipe loops and flex hose assemblies presented several challenges:

- Space Constraints: Large pipe loops were not feasible within congested mechanical corridors and overhead routing areas.
- Design Needs: Accommodate the full range of multi-directional movement required.
- Commercial Risk: Multiple vendors for joints, supports, and analysis increased coordination complexity and project risk.
- Schedule Pressure: Long lead times and fragmented sourcing threatened the construction timeline.

The project required a compact, engineered alternative that could handle movement requirements while simplifying procurement and installation.

PROJECT SNAPSHOT

PROJECT:

Battery Manufacturing Plant

SCOPE:

Delivered more than 200 expansion joints/pipe expansion loops along with engineered supports and guides across two large-scale manufacturing facilities.

CUSTOMER CHALLENGE:

The project required accommodating axial and lateral pipe movement across multiple systems, including chilled water, steam, nitrogen, compressed air and condensate lines. The customer was seeking to upgrade to an industrial-strength solution versus the flex hose design previously proposed while also improving the delivery timeline and not impacting overall cost.

US BELLOWS VALUE ADD:

US Bellows, a division of Piping Technology, developed a custom nested Super U-Loop solution using metallic expansion joints. This approach:

- Handled thermal and seismic movement more effectively.
- Fit within tight layout constraints.
- Added flow liners and protective covers to improve durability and resiliency in case of transient events such as steam hammers, which are common on many condensate lines.
- Included complete pipe stress analysis & PE-stamped engineering certification.
- Provided a single-source solution for expansion joints, supports, and guides.

RESULTS:

- Supplied 200+ expansion joints and loops ranging from 4" to 36".
- Completed 69 shipments covering 400 product configurations.
- Delivered over 6,000 total units.
- Executed from approval to final shipment in **five months**.

SOLUTION & IMPLEMENTATION

US Bellows developed a custom nested Super U-Loop configuration using metallic expansion joints to replace traditional pipe loops.

This approach allowed the system to absorb movement within a significantly reduced footprint while maintaining long-term reliability.

Piping Technology provided a single-source solution, integrating:

- Expansion joints
- Pipe Expansion U-loops
- Engineered pipe supports
- Guides and anchors
- Pipe stress analysis

This integrated delivery model reduced interface risk, improved design coordination, and accelerated project execution.

Close collaboration with the contractor, engineer of record, and installation teams ensured that designs were aligned with field conditions and installation sequencing, minimizing rework and delays.

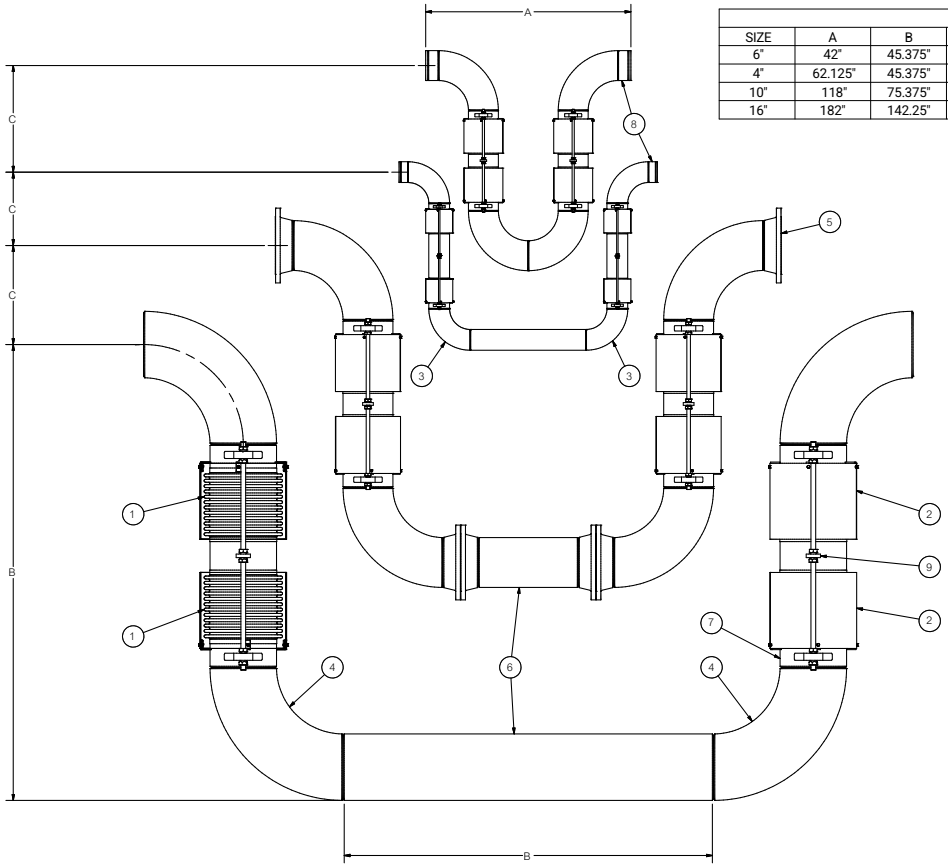

Table								
SIZE	A	B	C	D	TAG	SERVICE	MVMT	DESIGN RATING
6"	42"	45.375"	N/A	N/A	EJ-MP-141-11	DCW	+/- 4"	130 PSI @ 48°F
4"	62.125"	45.375"	10"	N/A	EJ-MP-141-10	NPW	+/- 4"	130 PSI @ 48°F
10"	118"	75.375"	14"	42"	EJ-MP-141-14	NG	+/- 3"	100 PSI @ 100°F
16"	182"	142.25"	22"	86"	EJ-MP-141-9	CA	+/- 3"	100 PSI @ 100°F

MATERIAL LIST			
ITEM	QTY	QUOTE DESCRIPTION	MATERIAL
1	16	BELLOW	304 STAINLESS STEEL
2	16	COVER ASSEMBLY WITH HARDWARE	CARBON STEEL
3	8	ELBOW: L.R. 90 DEG	304 STAINLESS STEEL
4	8	ELBOW: L.R. 90 DEG	CARBON STEEL
5	8	FLANGE: 150#	CARBON STEEL
6	3	PIPE SPOOL: BEVEL BOTH ENDS	CARBON STEEL
7	16	PIPE SPOOL: BEVEL ONE END	CARBON STEEL
8	4	PIPE SPOOL: GROOVE ONE END, BEVEL ONE END	304 STAINLESS STEEL
9	16	TIE / LIMIT ROD ASSEMBLY	CARBON STEEL

ENGINEERING & DESIGN:

The solution was supported by a comprehensive pipe stress analysis to validate performance under thermal, pressure, and seismic loading conditions.

Key design features included:

- Nested expansion joint configuration to accommodate axial and lateral movement in constrained spaces.
- Flow liners to protect against turbulence and internal wear.
- Protective covers to enhance durability and extend service life.
- Custom-engineered supports and guides to control movement and ensure proper system behavior.
- PE-stamped calculations and drawings for full engineering validation.

This level of engineering ensured that the system not only fit within the available space but also performed reliably under all operating conditions.

FIELD SERVICE SUPPORT:

Following commissioning, minor construction issues / field adjustments were identified that limited the free movement of certain expansion joints.

Piping Technology and US Bellows responded quickly by:

- Evaluating field conditions
- Providing updated recommendations
- Supporting adjustments to ensure proper movement capability.

This rapid response minimized operational impact and reinforced system performance without requiring major rework.

RESULTS:

The project demonstrated the combined value of engineered products and manufacturing capability from Piping Technology and US Bellows:

Engineered Performance

- Successfully accommodated thermal, lateral, and seismic movement
- Eliminated the need for large, space-consuming pipe loops
- Delivered a more reliable and maintainable solution.

Manufacturing & Execution

- Produced and delivered 200+ expansion joints ranging from 4" to 36"
- Supplied over 400 product configurations and 6,000+ total units
- Completed 69 coordinated shipments to support construction sequencing
- Executed from approval to final shipment in approximately five months.

Project Value

- Reduced design and procurement complexity through a single-source solution
- Improved installation efficiency and minimized field modifications
- Supported aggressive project timelines with responsive manufacturing and delivery