

BEST PRACTICE 22

MSA- Threaded Fitting Specification Research Update
2021 Winter Workshop (R. 15-001-08)— Jan 22, 2021



BEST PRACTICE 22

» Agenda

- Threaded Fitting Specification Project
 - Project Objective and Milestones Reached
 - Phase I Results
 - Phase II Results
 - Conclusions and Next Steps

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» Threaded Fitting Specification Research Update

■ **Project Objective:**

- To understand the influence thread quality has on sealing performance by evaluating the thread specifications from National Pipe Taper (NPT) and Aeronautical NPT (ANPT) and testing representative samples for sealing performance.

■ **Milestones Reached:**

- Phase I laboratory study completed.
- Phase II laboratory study completed.



Threaded Fitting Specification Research Update

Phase I

» Background:

- **Task 1** – Determined which fittings to evaluate by completing an inventory of the most used (on an annual basis) fittings and fitting sizes
- **Task 2** – Thread measurements of 640 threaded outlets were taken to determine proportion of fittings that meet NPT dimensional specifications
- **Task 3** – Evaluated 76 NPT-NPT and 38 ANPT-ANPT joints that were pressurized (60 psig), temperature cycled (0 to 120 °F, 30 cycles), and inspected for leaks.

» Results:

- Out of the 325 fittings that passed NPT standard, 38% of those fittings also passed ANPT standards
- Out of the 114 joints, only a single 1" NPT valve/nipple joint leaked

Fitting type	Fitting sizes	# of outlets that passed NPT and ANPT	# of outlets that passed NPT but not ANPT
Elbow	1/2" to 2"	26	75
Nipple	3/4" to 1-1/2"	13	62
Swivel	3/4" to 1-1/2"	31	8
Tee	3/4" to 1-1/2"	33	9
Valve	3/4" to 1"	7	32
MSA Nipple	1/2" to 2"	13	16
Total		123 (38%)	202 (62%)

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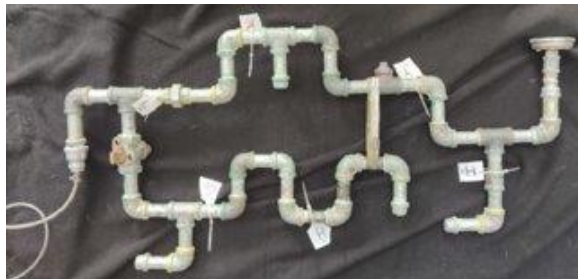
Phase II

» Background:

- Determined that a minimum of 63 joints of each NPT and ANPT were required to predict the number of joint leaks in a population of 1,000,000 joints with a 95% confidence interval

» Results:

- Tested 109 NPT and 109 ANPT joints at the most common fitting size ($\frac{3}{4}$ "")
 - All test variables were kept the same as in Phase I (temperature, pressure, number of cycles, pipe sealant, tightening torque)
 - Checked for leaks at 0, 5, 10, 15, 20, 25, and 30 thermal cycles



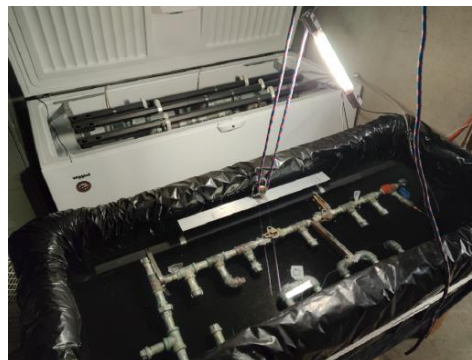
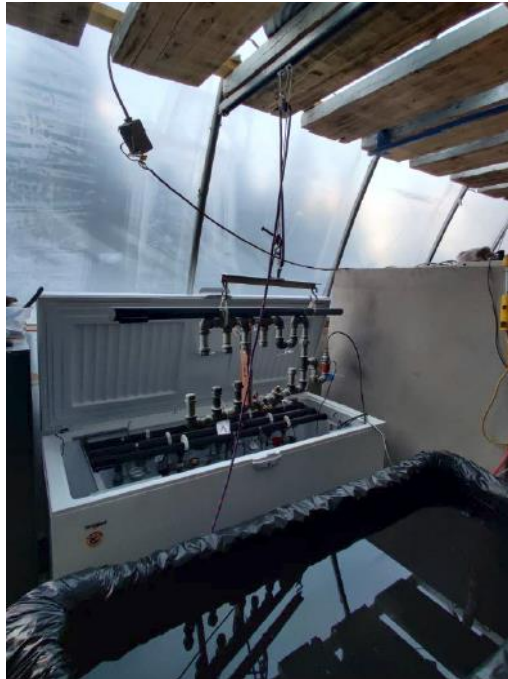
Summary Totals for NPT and ANPT Thread Measurements			
Threaded Outlets			
198 NPT INTERNAL		118 ANPT INTERNAL	
426 NPT EXTERNAL		109 ANPT EXTERNAL	
Outlet type		Outlet type	
97 Elbows		55 Elbows	
26 Valves		6 Valves	
70 Tees		35 Tees	
5 Misc internal		22 Misc internal	
426 Pipe nipples		109 Pipe nipples	



Threaded Fitting Specification Research Update Phase II

» Results (cont.)

- Out of 218 total joints, zero NPT joints leaked and zero ANPT joints leaked



Threaded Fitting Specification Research Update

Conclusions

» Conclusions

- Under the conditions tested, NPT threaded connections performed well despite not meeting ANPT quality standards.
- Additional testing is required to determine if other variables influence sealing capability, such as tightening torque, thread compound type, sunlight exposure, etc.

» Next Steps:

- Workshop with funding utilities to review results and discuss options for further research
 - Options to discuss
 - Extend laboratory testing with additional cycling and aging acceleration to obtain leaks on NPT and ANPT fittings for failure comparison
 - Perform laboratory analysis of leaking threaded joints obtained from the field to determine causes of failure

Questions?

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