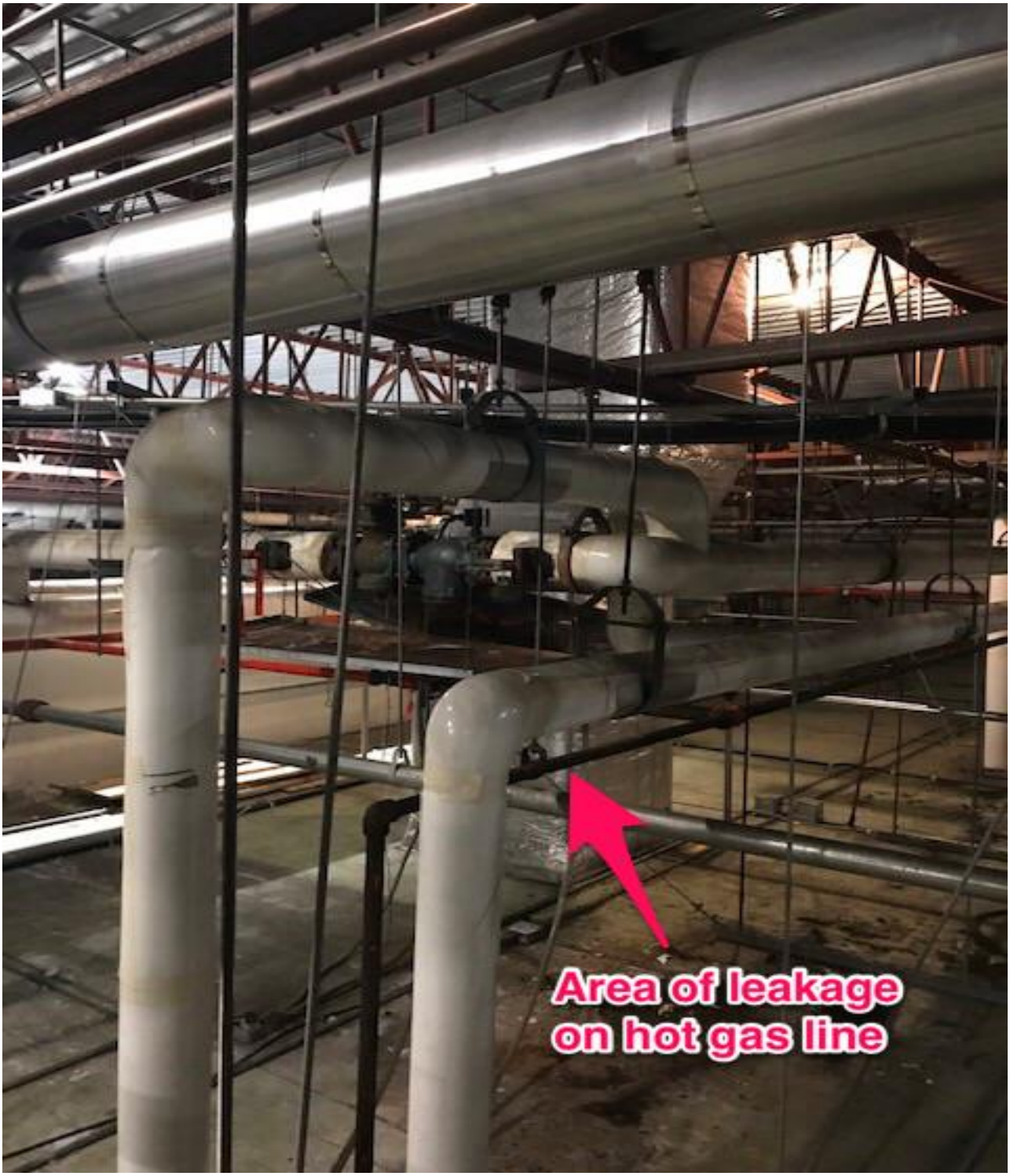
Incident Summary #II-765453-2019 (#9425) (FINAL)

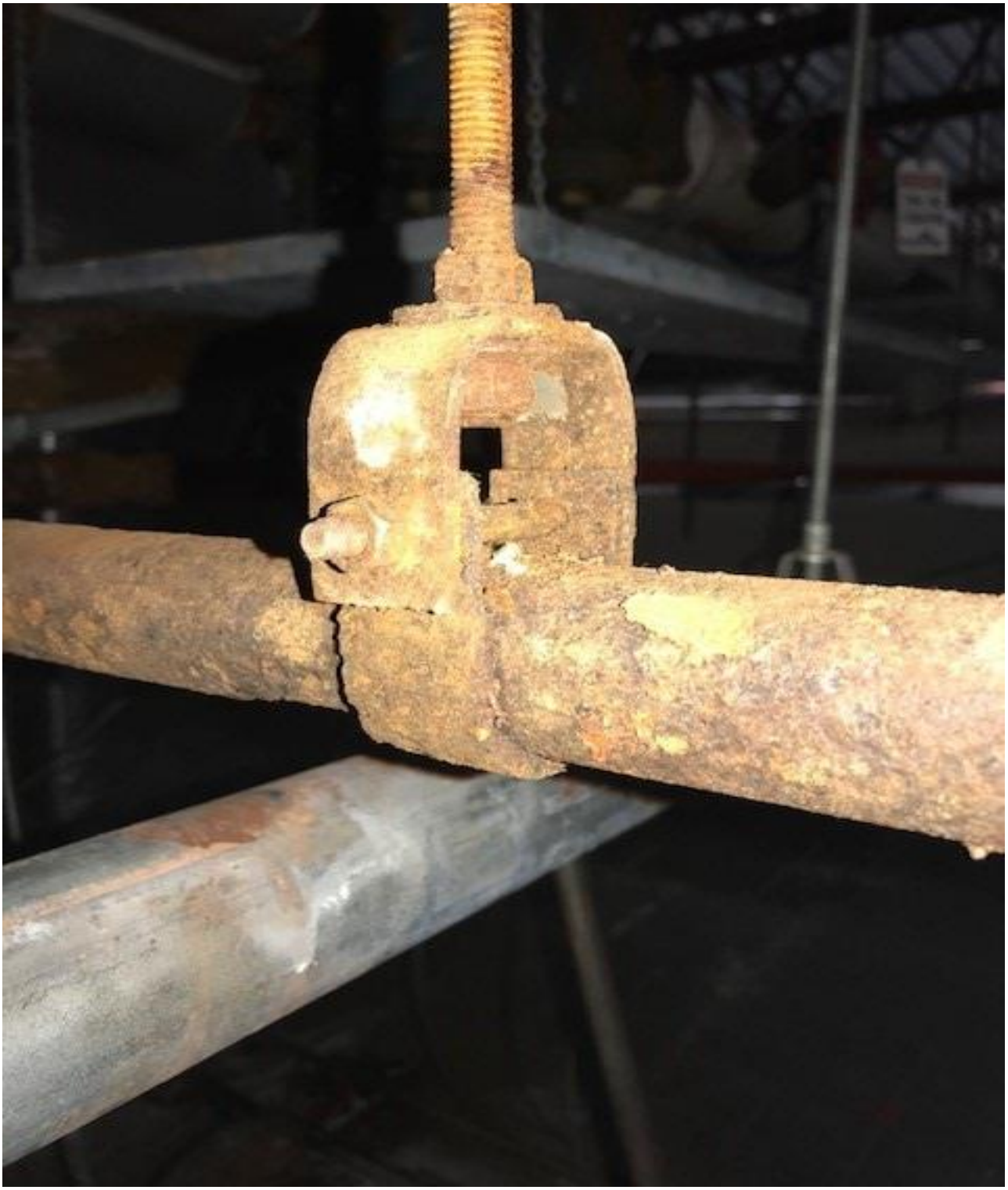
SUPPORTING INFORMATION	Incident Date		October 29, 2018
	Location		Cloverdale
	Regulated industry sector		Boilers, PV & refrigeration - Refrigeration system
	Impact – Injury	Qty injuries	0
		Injury description	N/A
		Injury rating	None
	Impact – Damage	Damage description	-Ammonia hot gas piping was corroded. -20ft of carbon steel piping had to be replaced due to corrosion. -The amount of ammonia released from system was calculated to be approximately 125lbs.
		Damage rating	Minor
	Incident rating		Minor
	Incident overview		An ammonia release occurred in the mezzanine area at an industrial food processing facility, which resulted in the evacuation of the facility and temporary shutdown of the ammonia plant.
INVESTIGATION CONCLUSIONS	Site, system and components		The industrial food processing facility has designated refrigerated rooms to keep food from spoiling. During a refrigeration cooling cycle, liquid ammonia travels through piping to an evaporator. The evaporator is part of the refrigeration system designed to produce the refrigeration by vaporization. Frost build up occurs as a result of vaporization effect on the evaporator coils which obstructs the flow and volume of air required to cool the space. Hot ammonia gas is piped to the evaporator which is designed to defrost the evaporator coils during a defrost cycle. Refrigerant piping is insulated to increase thermal efficiency which may include a vapor barrier type of insulation on certain applications to protect against surface condensation and ice buildup.
	Failure scenario(s)		During an evaporator defrost cycle, condensation formed on the hot gas line pipe. A section of hot gas pipe was insulated with a fibreglass material that did not have a vapor barrier and retained the moisture from condensation that was occurring during the defrost cycle. The fibreglass insulation material maintained a wet saturated condition that created an environment of corrosion attack from the contact of moisture to the carbon steel pipe. The slow process of the insulation absorbing the condensate created by the hot gas line during the defrost cycle caused thinning and degradation of the metal from the effects of corrosion. Over time, this caused an opening in the wall of the pipe where ammonia was able to escape to the space. (see picture 3&4 below)

Incident Summary #II-765453-2019 (#9425) (FINAL)

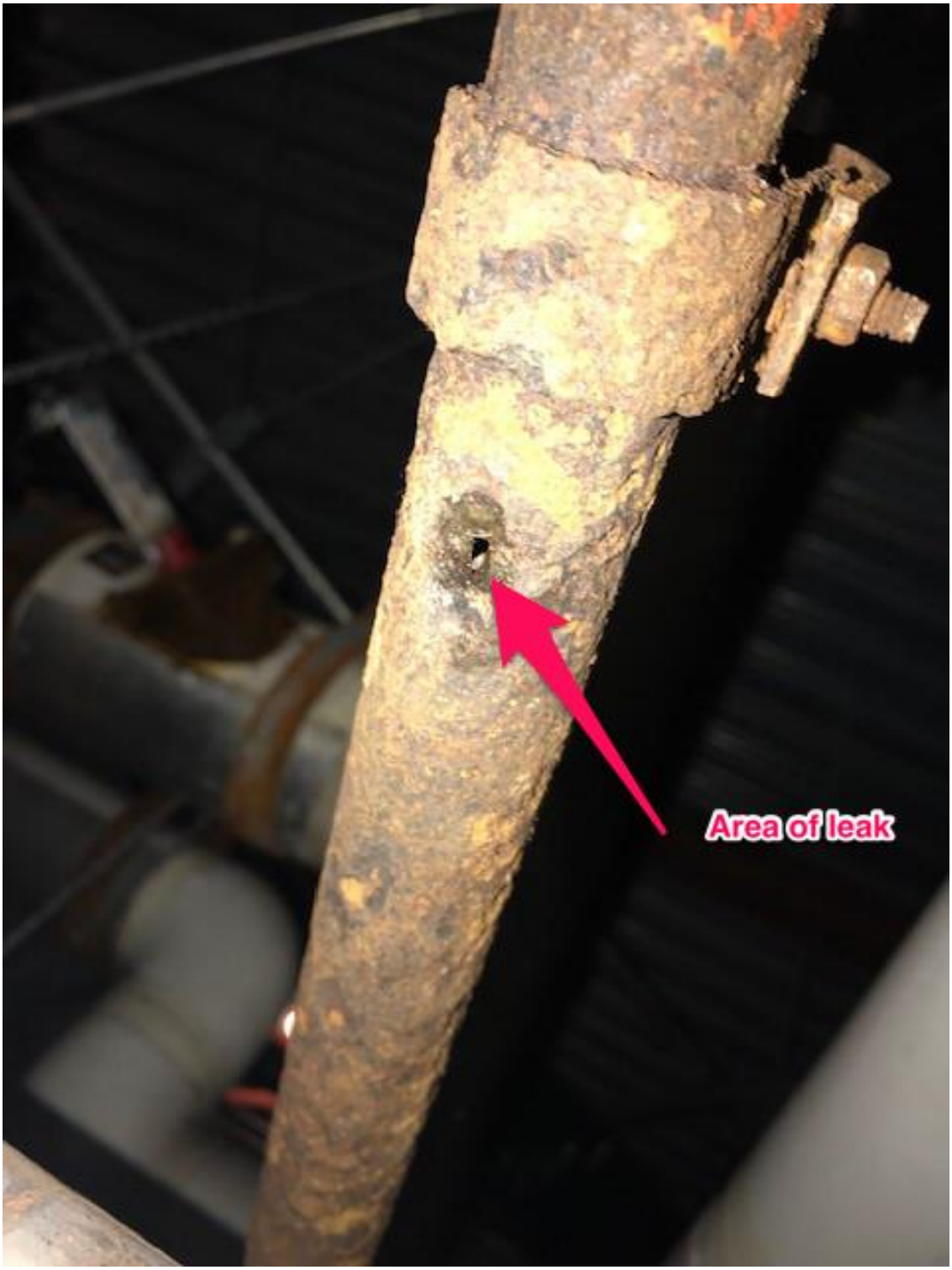
Facts and evidence	**Contractor Witness statement** • Contractor stated that original pipe was painted red to color code the hot gas line. • Contractor removed insulation and stated the insulation was heavy in weight from absorption of moisture. • Fiberglass insulation not usually applied to ammonia system's in cold environments. • Other hot gas lines that serve other evaporators in building have a Styrofoam vapor barrier type of insulation which protects against condensation and moisture absorption. • Calculated amount of ammonia released from system was 125lbs. • Contractor stated that when system was started up for testing after repairs and new hot gas pipe installed that condensate formed on the line before new insulation with vapor barrier was applied. Water droplets formed on the pipe which dripped on the ground, confirming that the line, if not insulated, formed condensation. **Contractor safety bulletin hazard alert** • Contractor that maintains the facility issued a company internal safety bulletin that indicated similar issues observed at other facilities they service. • There is a chance that ammonia refrigeration piping systems that have fiber glass insulation pose potential risks from corrosion in cold environments. **Company incident report** • Piping installed in 1996. • Non-insulated lines are inspected monthly/annually. • Insulated lines likely have not been inspected since installation. • Moisture underneath the insulation is unable to be identified by visual inspection. **Pictures** • Location of leak in mezzanine area : *see picture 1* • Corroded pipe*: see pictures 3&4* • Pipe hangers are of similar material to the pipe. :*see picture 2* • Pipe hangers were also corroded and were enclosed within the insulation. :*see picture 1* • Area of leak showed signs of metal thinning compared to rest of line. :*see picture 2* • Pinhole leak size of approximately 4mm diameter at bottom end of pipe. *See picture 4* • Hot gas line in question was insulated using a fiberglass insulation. • Removed insulation had signs of rust and metal flakes from pipe on the inside of insulation. *See picture 5*
Causes and contributing factors	It is very likely that the type of insulation that was used on the section of pipe, created the atmosphere for corrosive conditions to exist, which then led to ammonia escaping from a pinhole leak in the pipe.



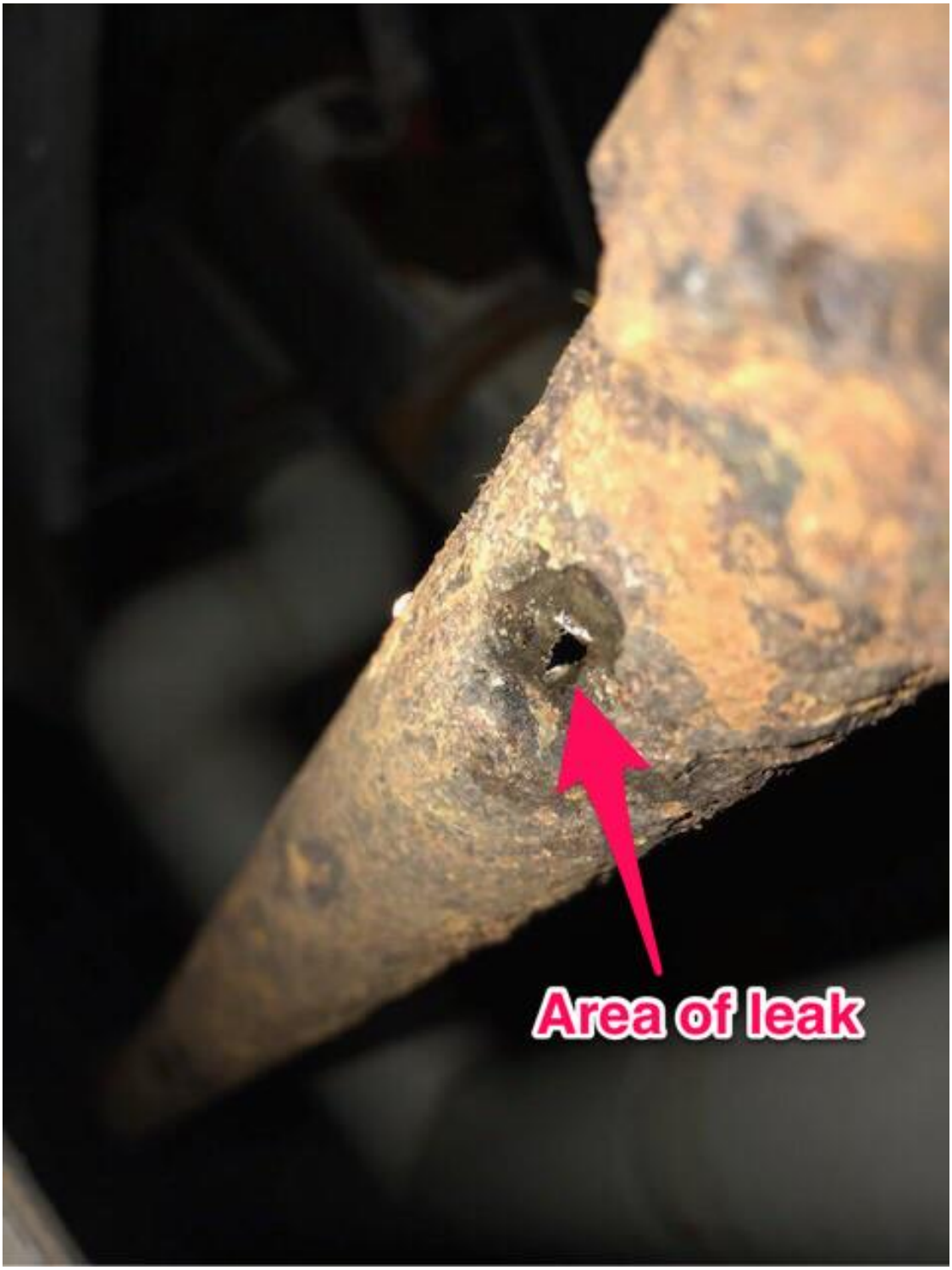
Picture 1 Mezzanine area above grinding room



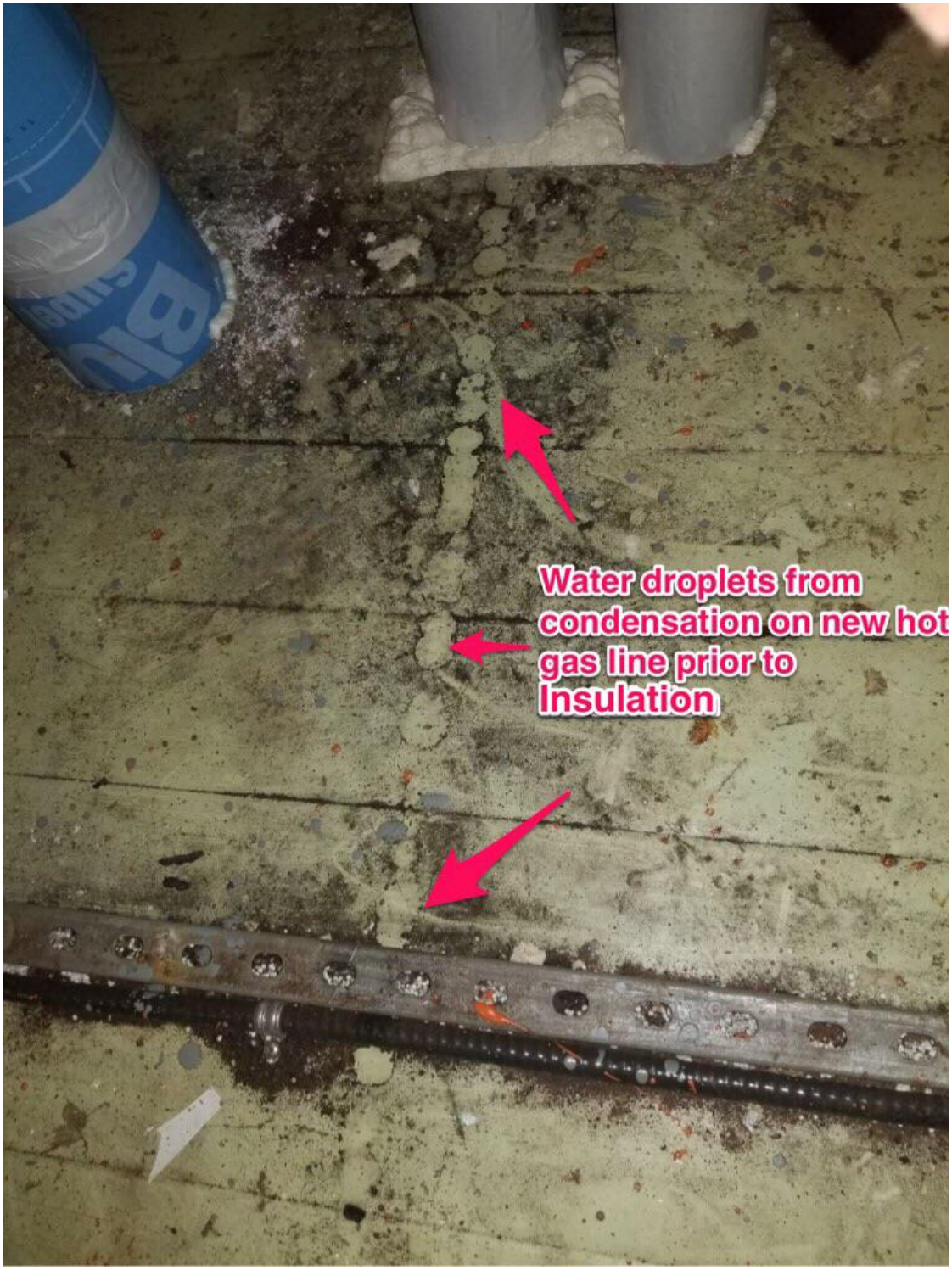
Picture 2 Corroded pipe, pipe hanger and metal thinning



Picture 3 Hot gas line and pin hole leak



Picture 4 Close up of pin hole



Picture 5 Mezzanine floor under newly installed hot gas pipe prior to new vapor type insulation being applied.