



Atlantic Division, Naval Facilities Engineering Command

FLASH WARNING - This could happen to you -

ACCIDENT ABSTRACT

ACCIDENT TYPE: Mechanical pipe failure causing explosive force/laceration
INJURY: Lacerations
TYPE OF WORK: Mechanical (seawater intake for reverse osmosis system)
EQUIPMENT INVOLVED: PVC/Fiberglass pipe, hydraulic test pump

DESCRIPTION OF THE ACCIDENT:

A service contractor was awarded a design build contract to upgrade a reverse osmosis (RO) water purification system. The contractor provided drawings detailing steel piping for the intake of seawater. During construction, the contractor changed the piping configuration allowing for PVC and Fiberglass piping to be used instead of the originally designed steel piping. During a required hydrostatic test procedure in which the pipe was to be pressurized to 100 PSI, a violent pipe failure occurred, causing the pipe to explode, sending rigid plastic fragments in every direction for hundreds of feet. One fragment contacted a passer by, not associated with the construction effort, resulting in a severe laceration to the head.

DIRECT CAUSE:

The test procedure did not allow for the release of entrapped air as required by the pipe manufacturer printed instructions. Instructions called for the placement of vents in piping high points where entrapped air is likely to occur. Entrapped air was created during the filling of the pipe with water for the pressure test. It is crucial that PVC pipe test procedures include provisions for the venting of entrapped air at the system high points to ensure the potential violent release of energy, due to the rapid displacement of the air from the water being pressurized, is prevented. Please refer to USACE EM 385-1-1 - 20.A.04 and printed manufacturer instructions.

CONTRIBUTING CAUSES:

The designer of record hired by the contractor did not submit revised drawings for review prior to changing the piping configuration.

LESSONS LEARNED:

Air or gas in PVC piping from any source is to be avoided. PVC pipe fittings do not have an established ASME rating. Letters to OSHA from similar mishaps describe the violent release of energy like an explosion, where in one example, the shrapnel of plastic flew 27 feet in the air and across a plant 60 feet embedding itself in an industrial roll of paper. This violent force, though published as common by manufacturer organizations has not been appropriately distributed throughout the construction industry.

CONSTRUCTION MISHAP TODAY=MISHAP PREVENTION TOMORROW

