UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

CIVIL MINUTES - GENERAL

Case No.	EDCV 06-55-GW-PJWx	Date	June 5, 2020
Title	*United States of America, et al. v. J-M Manufacturing Company, Inc.*		

Present: The Honorable	GEORGE H. WU, UNITED STATES DISTRICT JUDGE	
Javier Gonzalez	None Present	
Deputy Clerk	Court Reporter / Recorder	Tape No.

Attorneys Present for Plaintiffs:	Attorneys Present for Defendants:
None Present	None Present

PROCEEDINGS: IN CHAMBERS - ORDER

Attached hereto is the Court's ruling on Defendant's renewed Motion for Judgment as a Matter of Law. The Court sets a status conference for June 22, 2020 at 8:30 a.m., and the parties are to appear telephonically with advanced notice to the clerk. The parties are to meet and confer regarding scheduling of the remaining portions of the Phase Two trial (i.e. the civil penalties award). The parties will submit a joint status report in that regard by June 17, 2020, which will include proposed dates.

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Initials of Preparer JG

United States, et al. v. J-M Mfg. Co., Inc.; Case No. 06-cv-0055-GW-(PJWx)
Ruling on J-M Manufacturing Company, Inc.'s Renewed Motion for Judgment as a Matter of Law

I. Background

The parties are generally familiar with the procedural history of this False Claims Act ("FCA") case and, as such, only a brief summary is provided here.[1] The Court bifurcated the trial proceedings back on December 7, 2011, with the initial trial being limited to liability as to the claims of five Exemplar Plaintiffs.[2] *See* Order Addressing Bifurcation ("Bifurcation Order"), Docket No. 551. Pursuant to the Bifurcation Order, the parties tried three issues in the "Phase One" trial: (1) falsity, (2) materiality, and (3) scienter.[3] *See id.* at 1. Those three elements are sufficient to establish liability under the federal False Claims Act:

> To establish a cause of action under the False Claims Act (FCA), 31 U.S.C. § 3729(a)(1), the government must prove three elements: (1) a "false or fraudulent" claim; (2) which was presented, or caused to be presented, by the defendant to the United States for payment or approval; (3) with knowledge that the claim was false.

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[1] *See generally United States v. J-M Mfg. Co., Inc*., Case No. 06-cv-0055-GW-(PJWx), 2018 WL 1801258 (C.D. Cal. April 12, 2018).

[2] This action was brought by the qui tam plaintiff on behalf of the federal government and over 190 state, county and municipal entities. *See* Exhibit 1 to the Third Amended Complaint ("TAC"), Docket No. 324-3. The subject of the litigation was polyvinyl chloride ("PVC") pipe used in governmental water projects. *See* TAC ¶¶ 1-2, Docket No. 324-1.

[3] As stated in the Bifurcation Order:

> Plaintiffs allege that J-M falsely represented that (a) **all** (not just some) J-M pipe satisfied the requirements, rules, and standards of the various standards bodies, which pipe and standards were identified with particularity in their November 30th submission; and (b) **all** (not just some) of the pipe was manufactured in a substantially identical manner to the pipe that was originally determined to comply with the standards. Plaintiffs allege that J-M's statements were false because J-M did not properly manufacture "all" its pipe as represented in (a) and (b) above. Plaintiffs further allege that J-M's statements were false because J-M did not uniformly test its pipe as represented in (a) and (b) above. Plaintiffs allege that instead, J-M manufactured or tested its pipe in a manner that did not comply with the foregoing industry standards. Plaintiffs allege that, as a result of JM's inconsistent and substandard manufacturing and testing, J-M's customers received a "lottery ticket," in which there was no assurance that the pipe was made and tested in the manner represented. The first jury will decide whether J-M's manufacturing and testing deficiencies deviated from its representations to such a degree as to render J-M's representations false.

See Docket No. 551 at 8 of 11 (emphasis in original).

United States v. Mackby, 261 F.3d 821, 826 (9th Cir. 2001) (citing 31 U.S.C. § 3729(a)(1)); *see also U.S. v. Bourseau*, 531 F.3d 1159, 1171 (9th Cir. 2008) (recognizing a "materiality requirement" for FCA claims);[4] *but see Universal Health Servs. v. United States ex rel. Escobar*, 136 S. Ct. 1989, 1999 n.2 (2016) ("The False Claims Act abrogates the common law in certain respects. For instance, the Act's scienter requirement 'require[s] no proof of specific intent to defraud.' 31 U.S.C. § 3729(b)(1)(B).").[5]

After a lengthy trial on liability in Phase One, on November 14, 2013, the jury returned a verdict in favor of the five Exemplar Plaintiffs[6] on all issues and as to the 26 projects where claims had been submitted. *See* Phase One Special Verdict, Docket No. 1794. Over the next few years and in response to the parties' many post-trial motions, the Court disseminated numerous rulings orally from the bench and in writing interpreting the Phase One verdict and the damages issues that were to be presented in the second phase of trial ("Phase Two"). The Phase Two trial on damages began on October 9, 2018. Docket No. 2688. The trial lasted multiple weeks with the jury beginning its deliberations on November 7, 2018. After the jury twice reported that it could not reach a verdict, the Court declared a mistrial on November 14, 2018. *See* Docket No. 2765.

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[4] These are essentially the elements required for a claim brought under 31 U.S.C. § 3729(a)(1)(B). *See* Claire M. Sylvia, The False Claims Act: Fraud Against the Government §§ 4:2, 4:3 (2015). The FCA was amended in 2009 to add language that directly addressed the materiality requirement that most circuits had already read into the statute. *See id.* § 4:57 (discussing 2009 Amendments to the federal FCA).

[5] In the Phase One trial, the issue of damages was not raised as the Plaintiffs argued and the Court agreed that no showing of injury or damages to the government was needed to establish liability under the FCA. *See* Plaintiffs' Proposed Jury Instruction No. 45 – No Need to Show Damage, Docket No. 1765; *see also Bly-Magee v. California*, 236 F.3d 1014, 1017 (9th Cir. 2001) ("[A] qui tam plaintiff need not prove that the federal government will suffer monetary harm to state a claim under the FCA.").

[6] The five Exemplar Plaintiffs are: (1) Calleguas Municipal Water District in California; (2) City of Norfolk, Virginia; (3) City of Reno, Nevada; (4) Palmdale Water District in California; and (5) South Tahoe Public Utility District in California. *See* Final Jury Instructions at 1, Docket No. 2756.

Although the Exemplar Plaintiffs are all state governmental entities, reference throughout this action has most often been to the federal FCA statute and concomitant case law. This is because the relevant state FCA statutes were patterned after the federal law and, where there is a dearth of state authority for a proposition, the state courts have turned to federal cases for guidance. *See e.g. City of Pomona v. Superior Court*, 89 Cal. App. 4th 793, 801-02 (2001) ("California's False Claims Act is 'patterned on a similar federal statutory scheme (31 U.S.C. § 3729 et seq.).' . . . Given the lack of California authority and the very close similarity of California's act to the federal act, it is appropriate to turn to federal cases for guidance in interpreting the act."); *Simonian v. Univ. & Cmty. College Sys.*, 122 Nev. 187, 192 (2006) ("Nevada's FCA is modeled after the federal FCA . . . . in drafting Nevada's FCA the Nevada Legislature looked to the federal FCA"); *Commonwealth ex rel. Hunter Labs., LLC v. Quest Diagnostics Inc.*, 95 Va. Cir. 323, 326 (2017) ("the VFATA [Virginia Fraud Against Taxpayers Act which is that state's FCA] is based on the [federal] FCA and mirrors its provisions . . . . The General Assembly adopted the 'same substantive language' in the FCA when originally enacting the VFATA, indicating the legislature's intent for state courts to construe the state statute as the federal courts construe the federal statute.").

About a month later, on December 12, 2018, Defendant J-M Manufacturing Company, Inc. ("J-M") filed this renewed motion for judgment as a matter of law.[7] *See* J-M Manufacturing Company, Inc.'s Renewed Motion for Judgment as a Matter of Law ("Renewed JMOL Motion"), Docket No. 2809. Plaintiffs filed an opposition. *See* Plaintiffs' Memorandum of Law in Opposition to J-M's Renewed JMOL Motion ("Opp'n"), Docket No. 2814. Defendant filed a reply. *See* J-M Manufacturing Company, Inc.'s Reply in Support of Its Renewed JMOLMotion ("Reply"), Docket No. 2816.

At the February 20, 2019 hearing, the Court clarified certain matters pertaining to the Renewed JMOL Motion and sought elucidation on other topics from the parties. *See generally* Feb. 20, 2019 Civil Minutes ("Clarification Order"), Docket No. 2820; *see also* Transcript of Feb. 20, 2019 Hearing ("2/20/19 Hr. Trans."), Docket No. 2822-2. The Court stated the following in the Clarification Order:

> In terms of the scope of the present review, the Court notes at the outset that it will not use the JMOL hearing or briefing to reconsider any prior rulings made during the pendency of this case. This includes rulings regarding previously filed motions in limine, motions for summary judgment, *Daubert* motions, and rulings made prior to and during trial such as those regarding jury instructions, among others. Of course, for disputes that the Court did not resolve during the pendency of trial because all evidence had not yet been presented, the Court would make such rulings as necessary in deciding the JMOL Motion. In addition, the parties may not use the JMOL related briefing as a vehicle to attack the Phase One Jury's findings or rehash the liability phase of this case. Consequently, the issue before the Court is limited to actual damages.[8] To the extent that the JMOL-related briefing of either side rehashes already decided motions or arguments, the Court will simply ignore those arguments. If the Court denies the JMOL Motion and allows the case

[7] Defendant filed its initial motion for judgment as a matter of law on October 31, 2018, during the Phase Two trial. *See* Docket No. 2729. That motion was denied without prejudice.

> [8] In the same vein, statutory damages (also referred to as civil penalties) under false claims act statutes are not the subject of this motion and, indeed, have still to be tried. Thus, the JMOL Motion at most seeks partial judgment as a matter of law, without the issue of statutory damages/civil penalties. Nevertheless, the Court would make two observations at this point in regards to the subject of civil penalties.
>
> First, civil penalties themselves serve both deterrent and remedial purposes and, hence, a court may award such penalties even when the Government has not suffered, or cannot establish, actual damages. *See San Francisco BART Dist. v. Spencer*, Case No. C-04-046323-SI, 2007 WL 911851 *1 (N.D. Cal. Mar. 23, 2007) ("Here, plaintiff failed to prove any actual damages. However, despite an inability to establish injury, plaintiff may still receive the statutory penalty for each violation of the CFCA.").
>
> Second, during the Phase Two trial, the parties agreed that the issue of statutory damages/civil penalties would be tried to the Court . . . .

> to proceed to retrial, the Court will not reconsider any prior ruling (oral or written) absent a formal written motion for reconsideration.[9]
>
> Narrowing the scope of the JMOL briefing in the foregoing manner, the only issue is whether Plaintiffs presented sufficient evidence for a reasonable juror to come out in their favor regarding the theory of damages presented at the end of trial. In other words, the question is whether, *based on the evidence presented at trial and with all prior rulings taken into consideration*, a reasonable juror could award some amount of actual damages that would not be totally unfounded or purely speculative based on the liability found in Phase One. This is the sole issue that the Court will address and would like the parties to address at the February 20, 2019 hearing. Though the Court withholds ruling at this time, it does note that Defendant has made some initially persuasive arguments about a lack of evidence at trial. Indeed, to survive the JMOL Motion, Plaintiffs will have to do more than merely establish the remote possibility of some amorphous amount of nominal damages. Given its burden of proof, Plaintiffs had to have presented the jury with a basis to award some damages figure founded on more than pure speculation. That is part of what separates recovery of actual damages from statutory damages.

See Clarification Order at 2-3 (emphasis and footnotes in original, but footnotes renumbered for this document).[10]

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[9] The Court would highly discourage the filing of any motions for reconsideration if the JMOL Motion is denied. The Court is inclined to believe, based on the history of this litigation, that any motion for reconsideration would likely constitute an opportunity to reargue previous motions or present evidence that was or should have been raised earlier. That is not a basis for reconsideration and the Court would summarily deny any such motions that fall into those buckets. *See Moore v. Grundman*, No. 11-CV-01570-DMS-(WMCx), 2012 WL 1252711, at *1 (S.D. Cal. Apr. 13, 2012) (citation and internal quotation marks omitted); *see also United States v. Westlands Water District*, 134 F. Supp. 2d 1111, 1131 (E.D. Cal. 2001) (noting that "[a] motion for reconsideration is not a vehicle to reargue the motion or to present evidence which should have been raised before . . . . [and that a] party seeking reconsideration must show more than a disagreement with the Court's decision, and recapitulation . . . of that which was already considered by the Court in rendering its decision."). The parties will have a chance to appeal and they are welcome to make any such arguments to the Ninth Circuit. As to the local rules, Local Rule 7-8 provides:

> A motion for reconsideration . . . may be made only on the grounds of (a) a material difference in fact or law from that presented to the Court before such decision that in the exercise of reasonable diligence could not have been known to the party moving for reconsideration at the time of such decision, or (b) the emergence of new material facts or a change of law occurring after the time of such decision, or (c) a manifest showing of a failure to consider material facts presented to the Court before such decision.

See Local Rule 7-8. If the parties would like earlier rulings reconsidered after the Court's hypothetical denial of the JMOL Motion, the Court would require two-page briefs for each motion for reconsideration invoking one of the enumerated bases for reconsideration.

[10] J-M appears to be renewing (and/or making post-trial) motions under *Daubert v. Merrell Dow Pharm., Inc.*, 507 U.S. 579 (1993), seeking review as to certain portions of Plaintiffs' experts' opinions, but in the context of their actual testimony at trial versus the offer of proof that was made during the pre-trial *Daubert* motions. Such procedure is permissible. *See e.g. Drake v. Delta Air Lines, Inc.*, No. 94-CV-5944(FB)(RML), 2005 WL 1743816 at *8 (E.D.N.Y., July 21, 2005) (holding that even though the trial court had initially allowed plaintiff's expert to testify after conducting a *Daubert* hearing, it could reevaluate that decision pursuant to a motion under Fed. R. Civ.

At that hearing, the Court requested additional materials and exposition from the parties, and Plaintiffs thereafter filed supplemental briefing along with evidence that they argued would defeat the Renewed JMOL Motion. *See* Plaintiffs' Supplemental Memorandum of Law in Opposition to J-M's Motion for Judgment as a Matter of Law ("Pl.'s Supp."), Docket No. 2821. J-M filed its own supplemental briefing a week later. *See* J-M Manufacturing Company, Inc.'s Submission in Support of Its Renewed MJOL Motion ("Def.' Supp."), Docket No. 2822. A further hearing on the Renewed JMOL Motion was held on April 22, 2019, and the matter was taken under submission. *See* Docket No. 2824.

II. Legal Standard

"A jury's inability to reach a verdict does not necessarily preclude a judgment as a matter of law." *Headwaters Forest Def. v. Cty. of Humboldt*, 240 F.3d 1185, 1197 (9th Cir. 2000), *vacated on other grounds*, 534 U.S. 801 (2001). Ninth Circuit precedent dictates that "[t]he same standard applies to a motion for judgment as a matter of law made after a mistrial because of jury deadlock." *Nichols v. City of San Jose*, No. 14-CV-03383-BLF, 2017 WL 3007072, at *1 (N.D. Cal. July 14, 2017) (citing *Headwaters*, 240 F.3d at 1197 n. 4 ("The fact that the motion was granted after a mistrial was declared because of jury deadlock does not alter the standard to be applied on appeal.")).

When deciding a motion for judgment as a matter of law, the district court must determine whether − based on the evidence presented at trial − "no reasonable juror could find in the non-moving party's favor." *Torres v. City of Los Angeles*, 548 F.3d 1197, 1205 (9th Cir. 2008) (internal quotation marks omitted and citation omitted); *see also* Fed. R. Civ. P. 50(a)-(b). "The evidence must be viewed in the light most favorable to the nonmoving party, and all reasonable inferences must be drawn in favor of that party. If conflicting inferences may be drawn from the facts, the case must go to the jury." *Torres*, 548 F.3d at 1205-06 (citation and internal quotation marks omitted). "[T]he court should review all of the evidence in the record. In doing so, however, the court must draw all reasonable inferences in favor of the nonmoving party, and it may not make credibility determinations or weigh the evidence." *Reeves v. Sanderson Plumbing Products, Inc.*, 530 U.S. 133, 150 (2000). Indeed, the court must look at the record "as it existed when the trial

P. 50(b)); *see also Goebel v. Denver & Rio Grande Western R.R. Co.*, 215 F.3d 1083, 1087 (10th Cir. 2000) ("The district court may also satisfy its gatekeeper role [under *Daubert*] when asked to rule . . . on a post-trial motion . . . .").

was closed." *Elbert v. Howmedica, Inc.*, 143 F.3d 1208, 1209 (9th Cir. 1998).

To successfully move for judgment as a matter of law, the moving party must satisfy the aforementioned "very high" standard. *Costa v. Desert Palace*, 299 F.3d 838, 859 (9th Cir. 2002). The reason for such a high standard is that courts should ordinarily not impinge upon the province of the jury. *Id.* at 859 ("This high hurdle recognizes that credibility, inferences, and fact finding are the province of the jury, not this court."). "Judgment as a matter of law is appropriate when the *evidence presented at trial* permits only one reasonable conclusion." *See Torres*, 548 F.3d at 1205 (citation and internal quotation marks omitted) (emphasis added).

III. Background on FCA Damages Law

A. Applicable law

FCA damages "typically are liberally calculated to ensure that they 'afford the government complete indemnity for the injuries done it.'" *United States ex rel. Compton v. Midwest Specialties, Inc.*, 142 F.3d 296, 304 (6th Cir. 1998) (quoting *United States ex rel. Marcus v. Hess*, 317 U.S. 537, 549 (1943)). Generally, the measure of the government's *actual* damages under the FCA (as opposed to the civil penalties/statutory damages) is "the amount that it paid out by reason of the false statements over and above what it would have paid if the claim had been truthful." *United States v. Woodbury*, 359 F.2d 370, 379 (9th Cir. 1966). Simple as it may sound, "[p]roper application of this benefit-of-the-bargain measure depends on the particular circumstances of the case." *United States v. Sci. Applications Int'l Corp.* (*"SAIC III"*), 626 F.3d 1257, 1278 (D.C. Cir. 2010). For example, "[w]here a contractor's fraud consists of knowingly submitting nonconforming goods with ascertainable market value, the Supreme Court has instructed that '[t]he Government's actual damages are equal to the difference between the market value of the [product] it received and retained and the market value that the [product] would have had if [it] had been of the specified quality.'" *Id.* at 1279 (quoting *United States v. Bornstein*, 423 U.S. 303, 316 n.13 (1976)). Alternatively, in certain cases where the market value of the conforming goods or services is impossible to determine, courts have calculated damages as "the amount the government actually paid minus the value of the goods or services the government received or used."[11] *Id.*; *see also*, Joel M. Androphy, Federal False Claims Act & Qui Tam Litigation §

[11] As further noted in *SAIC III*, [u]nder this benefit-of-the-bargain framework, the government will sometimes be able to recover the full value of payments made to the defendant, *but only where the government proves that it received no value from the product delivered.*" 626 F.3d at 1259 (emphasis added).

11.03[2] (2009).

Despite the emergence of certain patterns as to FCA damage determinations in the case law, there is substantial variance depending on the facts of each case. For example, some courts follow the approach described in *SAIC III* and determine the government's actual damages by deducting the value of nonconforming goods from the contract price paid by the government, while others do not.[12] *See, e.g.*, *United States ex rel. Longhi v. United States*, 575 F.3d 458, 473 (5th Cir. 2009); *United States v. United Techs. Corp.*, 626 F.3d 313 (6th Cir. 2010) (as amended). On the other hand, "some courts find where it is impossible to determine the value of the nonconforming goods, the court must award the full amount of the Government's payments for the goods as the appropriate measure of the Government's damages." *See United States ex rel. Humane Society of the United States ("Humane Society")*, No. EDCV 08-00221-VAP-(OPx), 2013 WL 5753784, at *8 (C.D. Cal. Apr. 30, 2013) (citing *United States ex rel. Feldman v. van Gorp*, 697 F.3d 78 (2nd Cir. 2012). As discussed *infra*, the Phase Two jury was instructed that actual damage was calculated based upon the difference between the value of the pipe that the plaintiff received and the value the pipe would have had if it had been as represented by J-M. *See* Phase Two Jury Instructions at 3, Docket No. 2756.[13]

B. Relevant Jury Instructions

As to the 26 projects at issue, the Phase One jury found, *inter alia*, that J-M had "falsely represented uniform compliance with AWWA C905 [and/or C900[14]] and UL [Underwriters

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[12] The Court recognizes that there are many other cases that discuss and address FCA damages in the context of non-conforming goods. This section is provided merely for context and does not encompass the entirety of the law in this area.

[13] As stated in Plaintiffs' Memorandum of Law in Opposition to J-M's Motion for Judgment as a Matter of Law:

> The parties agree that (1) the proper measure of damages is the "benefit of the bargain," (2) the terms of the bargain" are recited in the contract documents, and (3) the basic measure of damages is that amount necessary to return Plaintiffs to the position they would have been in were J-M's claims not false. *See United States v. Mackby*, 339 F.3d 1013, 1018 (9th Cir. 2003) (quoting *United States v. Woodbury*, 359 F.2d 370, 379 (9th Cir. 1966)). "In calculating FCA damages, the fact-finder seeks to set an award that puts the government in the same position as it would have been if the defendant's claims had not been false." *United States v. Sci. Applications Int'l Corp.*, 626 F.3d 1257, 1278 (D.C. Cir. 2010).

Docket No. 2814 at 4 of 22.

[14] AWWA C900 refers to the American Water Works Association ANSI/AWWA C900-97: AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12 in. (100 mm Through 300 mm), for Water Distribution ("AWWA C900"). *See* Trial Exhibit ("Tr. Ex.") AWWA-004, admitted October 11, 2019, Docket No. 2804-2 at 33 of 35. AWWA C905 refers to American Water Works Association

Laboratories, Inc."] 1285." *See* Phase One Verdict at 2 *et seq*., Docket No. 1794.[15] In Phase Two, the jury was instructed that in the Phase One trial:

> Plaintiffs claimed that there had been a substantial decline in three key tests that are part of these industry standards. Those three tests are: (1) abbreviated Hydrostatic Design Basis testing, referred to by shorthand as "HDB" testing; (2) Longitudinal Tensile Strength testing, referred to by shorthand as "LTS" testing; and (3) "Quick Burst" Testing, referred to by shorthand as "QB" testing. Plaintiffs claimed that each of these tests measure, directly or indirectly, the long-term strength and durability of the PVC pipe. Plaintiffs further claimed that the substantial declines in these tests demonstrated that the pipe that J-M manufactured during the period of time Plaintiffs acquired J-M pipe for their 26 projects did not uniformly have the same quality, strength, and durability of the PVC pipe that was initially qualified as complying with the industry standards.

See Phase Two Jury Instructions at 2, Docket No. 2756. Additionally, in the Phase One trial, the jury was informed that in FCA cases "No showing of actual damage is required to establish a false or fraudulent claim for payment." *See* Phase One Jury Instructions at 7, Docket No. 1792. Thus, the Phase Two jury was instructed that:

> While the Phase 1 Jury found J-M to be liable under the relevant False Claims Act statutes, the Phase 1 Jury was not asked to decide and did not determine: (1) what, if any, actual damages resulted from J-M's violations of the statutes, and (2) the amount of Plaintiffs' damages, if any, caused by J-M's violations of those statutes. Those determinations were left to you as the "Phase 2 Jury" to decide in this trial. * * * *
>
> Under the False Claims Act statutes involved in Phase 2, a Plaintiff can seek recovery of: (1) the amount of actual damages that it sustained because of the false claims submitted by J-M; and (2) civil penalties as provided in the statute for each false claim submitted by J-M. * * * *
>
> As to actual damages, Plaintiffs contend that, as a result of J-M's failure to manufacture and test its pipe in a manner that assured that it had the quality, strength and durability as required under the applicable industry standards, the pipe Plaintiffs purchased will fail sooner than pipe that conformed to the applicable

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ANSI/AWWA C905-97: AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 in. through 48 in. (350 mm Through 1,200 mm), for Water Transmission and Distribution ("AWWA C905"). *See* Tr. Ex. AWWA-007, admitted November 6, 2018, Docket No. 2804-2 at 33 of 35.

C905 pipe is basically the same as C900 pipe but with a larger diameter; and, as relevant to this lawsuit but with one notable exception cited below, both practically have the same standards. *See* Testimony of Steven Folkman ("Folkman Test."), Trial Transcript ("Tr. Trans.") on October 25, 2018 at 4420, Docket No. 2844.

[15] As to one claim (*i.e.* 2310-2312) for Plaintiff Palmdale Water District, the Phase One jury found that the claim was false because "These IRA's testing tensil [sic] strength average PSI fails to meet UL requirements." *See* Phase One Verdict at 17. As to Plaintiff City of Reno, a small number of claims were additionally found to be false because J-M had indicated that its pipes were "UL on the brochure." *See* Phase One Verdict at 28, 31.

> industry standards and thus will have to be replaced sooner. Plaintiffs seek damages for the difference between the value of the pipe Plaintiffs received and the value the pipe would have had if it had been as represented by J-M.

See Phase Two Jury Instructions at 3, Docket No. 2756.

The Phase Two Jury was also given the following instruction on the issue of replacement/ consequential damages:

> You have seen certain evidence and heard certain testimony from Plaintiffs' witnesses and experts regarding the alleged need for, and cost of, replacing Plaintiffs' pipe, including the costs of installation and removal. You also have seen certain evidence and heard certain testimony from the witnesses of the present value or loss cost based on such replacement costs, and insurance premium damages based on such costs. I have held as a matter of law that Plaintiffs may not seek to recover as actual damages the costs of removal of old pipe and the installation of new pipe and/or insurance premium damages based on such costs. This is a legal determination on the Court's part.

See Phase Two Jury Instructions at 5, Docket No. 2756.[16]

IV. Analysis

The question here is whether – based upon the Phase One jury's verdict, the Court's prior rulings, the evidence proffered at the Phase Two trial (and drawing all reasonable inferences in Plaintiffs' favor from that evidence), the jury instructions, and the Plaintiffs' litigation positions stated in the Phase Two trial and thereafter – a reasonable jury could agree on some amount of money that could constitute an award of actual damages under the FCA that would not be erroneous as a matter of law, be totally unfounded, and/or be purely speculative.

During the consideration of J-M's Renewed JMOL Motion, there was comment on Plaintiffs' ever-morphing theories[17] as to actual damages and, as such, the Court required Plaintiffs to proffer a supplemental brief delineating Plaintiffs' precise contentions as to the bases for their recovery of actual damages with reference to the evidence proffered at the Phase Two trial that supported their claims. *See* February 20, 2019 Minute Order, Docket No. 2820; *see also* 2/20/19 Hr. Trans., Docket No. 2822-2. In their responsive submission, Plaintiffs state:

> At trial Plaintiffs' damage theory was benefit of the bargain, meaning the difference

[16] The reasoning behind this particular jury instruction is discussed in Section IV(B)(3), *infra*.

[17] In using the term "ever-morphing," the Court does not mean to imply that the Plaintiffs were games-playing and/or improperly litigating the issue. It is merely recognizing that Plaintiffs' theories as to actual damages "evolved" during the litigation, sometimes in response to particular rulings of the Court. *See, e.g.,* 2/20/19 Hr. Trans. at 7, Docket No. 2822-2 at 3 of 12.

> between the price Plaintiffs paid for the pipe, which was undisputed at trial, and the value of the pipe they received. As a result of rulings following the close of evidence, Plaintiffs proffered two methods of quantifying the value of the pipe they received: (1) that because the pipe would fail early and need to be replaced at great expense, it had little to no value; and (2) that because no reasonable municipality would purchase noncompliant pipe, it had little to no market value.

See Pl.'s Supp. at 1, Docket No. 2821.[18] Based upon the Plaintiffs' delineation of their actual damages theories (and concomitant methodologies), it is readily apparent that the Renewed JMOL Motion must be granted.

A. "Little to No Value" Because No Reasonable Municipality Would Purchase Noncompliant Pipe

Addressing Plaintiffs' latter argument/methodology first, the asserted fact that no reasonable municipality would ever purchase non-conforming goods does not establish that those goods have "little or no value." As this Court has already observed, the purported fact that a government entity would not intentionally purchase a particular item knowing that it did not conform to required specifications does not mean that the item necessarily has "little to no value."[19] *See* 2/20/19 Hr. Trans. at 20-21, Docket No. 2822-2. Rather, the issue of the government entity's not knowingly purchasing a non-compliant good goes to the materiality element of the FCA claim, not to the actual damages element once the purchase has been made. To adopt Plaintiffs' argument would impose a strict liability standard for FCA actual damages which would mean that, in every case, the losing defendant would always be obligated to refund the contract price regardless of any evidence of actual damages, and in turn that contract price award would be tripled under relevant statutory provisions. That approach is entirely inconsistent with the language of the FCA which provides that, in addition to a civil penalty of between $5,000 to $10,000, the losing FCA defendant must pay "3 times the amount of damages which the government sustains because of the act of that person." *See* 31 U.S.C. § 3729(a)(1).

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[18] At the February 20, 2019 hearing, Plaintiffs' counsel also stated that "our theory of damages would be the difference in value between the pipe we were promised which was compliant pipe and the pipe we received which was noncompliant pipe." *See* 2/20/19 Hr. Trans. at 8, Docket No. 2822-2 at 4 of 12.

[19] For example, suppose that an essential specification of a piece of pipe costing $100 was that it be able to be attached to a particular fixture but, due to a manufacturing error, it was non-compliant and the connection could not be made. If that problem could not be fixed, then one might say that the pipe had little to no value to the purchaser unless there was an after-sale market for the pipe. But suppose that the problem could be easily and completely remedied with the purchase of a $1 pipe fitting. In that latter situation, the non-compliant pipe would have substantial value to the purchaser.

Plaintiffs have argued that there are relevant cases which stand for the proposition that materially non-conforming goods can have zero value. However, none of those cases reach that conclusion merely on the notion that, because the government purchaser would not knowingly buy non-conforming goods, the value of those items must be set at (or near) zero for purposes of calculating actual damages. As importantly, the finding of zero value in those cases was based on entirely dissimilar facts than involved in this FCA case and also upon a different theory as to damage calculation.

For example, in the *Roby* and *Compton* cases (oft cited by the Plaintiffs in their damages discussions), it was held that zero dollars was the appropriate figure to attach to the nonconforming goods that the government received. In *U.S. ex rel. Compton v. Midwest Specialties, Inc.*, 142 F.3d 296, 298 (6th Cir. 1998), the government contracted with defendant to supply brake shoes for over 34,000 jeep vehicles where the brake shoes had to meet, *inter alia*, certain quality standards and where the defendant was obligated to test a varying number of the manufactured shoe kits. *Id.* at 297-98. After a period of use, the delivered brakes began malfunctioning. Thereafter, samples of 18 and 54 brake kits were evaluated by the government and found to have a failure rate of respectively 78 and 60 percent; plus it was discovered that defendant had not conducted the testing of one out of every 250 brake shoe kits as required under the purchase contract. Upon those discoveries, the government ordered every jeep vehicle "deadlined" until the brake shoes were removed and replaced, as the defective brake shoes at issue posed an imminent safety hazard to occupants of the vehicles rendering them totally unusable. In *Compton*, it was held that the government had established that the value goods received by it was zero (and hence it could recover the entire contract price) because immediately after discovery of the failures and the lack of testing by defendant, the government ceased all use of the brake shoe kits and had them removed from the vehicles.[20] *Id.* at 304-05.

In *U.S. ex rel. Roby v. Boeing Co.*, 302 F.3d 637, 647-48 (6th Cir. 2002), the government sought damages of $13 million for a new helicopter to replace a "remanufactured" helicopter it purchased for $4.1 million, which crashed (causing a total loss in excess of $10 million from the

[20] In *Compton*, there was no provision for an inclusion in the damages award for the labor and concomitant costs expended to effectuate the actual replacement of the brake shoes for the affected vehicles. The actual damages award in *Compton* was limited to the contract price for the brake shoes and did not include any replacement costs or other forms of consequential damages.

destruction of the helicopter and its contents) after 56 hours of flight time (but the helicopter was warranted for only 200 hours of flight time) due to the inclusion of a "defective flight critical transmission gear." *Id.* at 639-40. The parties reached a settlement of most of the issues, but on appeal reserved the question as to "[w]hether the [Government] can recover damages under the [FCA] for loss of a helicopter resulting from the failure of a defective flight-critical component part." *Id.* at 640. The *Roby* court held: (1) that the correct measure of actual damages therein was "the 'diminished value' or 'benefit of the bargain' test [where] we subtract the market value of what the Government received from what it was promised" (*id.* at 647); (2) damages in *Roby* were not limited to the value of the defective gear alone (where the defendant manufactured not only the faulty part but also the rest of the helicopter)[21] (*id.* at 646-48); (3) because the defective component posed an imminent danger to the lives of American service personnel, the fact that the Government did receive 56 hours of flight time before the actual crash would not be used to find that the remanufactured helicopter had any value other than zero[22] (*id.* at 647-48); (4) as to the actual damages figure, the court further stated that: (a) "the Government's damages equal the difference between the market value of Aircraft 89-0165 as received (zero) and as promised;" (b) "We do not presume to estimate the market value of a remanufactured helicopter;" (c) "the Government may recover damages under the FCA for the loss of a helicopter that results from the

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[21] Initially, the defendant in *Roby* argued that the basis for the actual damage award under the FCA could not exceed the price of the individual gear piece that was non-conforming; and the district court agreed. *See* 302 F.3d at 646. However, on appeal, the defendant conceded that "that damages under the FCA could equal − but never exceed − the amount of the claim, which in this case would be the approximately $4.1 million value of Boeing's contract to remanufacture Aircraft 89-0165." *Id.* In finding that the actual damages figure was the full contract price as submitted by the defendant to the Government, the Sixth Circuit explained:

> Negotiation strategy aside, we are at a complete loss as to how Boeing can understand "the amount wrongfully paid" to be limited to "the portion of the contract price allocated to the defective gear." . . . . According to our reading of the contract and the subsequent invoice, Boeing billed the Government for the remanufactured helicopters as units, not as assemblages of assorted parts . . . . The fact that every component but one conformed to contract requirements is not legally significant when the defective gear was "flight critical" and thus necessary for flight. Because the Speco gear was defective, Aircraft 89-0165 was defective, making Boeing's entire claim for payment false for the purposes of the FCA.

Id. at 646-47.

[22] In rendering this portion of its decision, the *Roby* court specifically conceded that it was relying upon a policy argument similar to the one it had adopted in *Compton*, 142 F.3d at 305 n.8 to the effect that: "[A] setoff based on value purportedly received would create a perverse incentive system in which government contractors could endanger the lives of American soldiers by providing substandard materiel, and the Army would be deterred from correcting the danger because it would be forced to bear the cost of any use it received from the substandard goods before their defects were discovered." 302 F.3d at 647-48. However, as noted herein, this present case is very factually different from both *Roby* and *Compton*.

failure of a defective flight-critical component part . . . . [but] these damages do not represent replacement costs;" (d) "[b]ecause the Government did not contract for a new helicopter, it may not recover the roughly $13 million value of the helicopter bought to replace the destroyed Aircraft 89-0165;" and (e) "[h]owever, it may recover the benefit of its bargain with Boeing, which would be the value that Aircraft 89-0165 would have had if it had been of the specified quality." *Id.* at 648-49.

The situation here contrasts sharply with *Roby* and *Compton*. Plaintiffs have presented no evidence that they have removed or contracted for the replacement of all (or any portion) of the J-M pipe in the ground; and it is undisputed that they have not ceased the use of that pipe and thereby have obtained, retained (for many years), and continue to receive value from it. Nor have Plaintiffs presented any sufficient evidence of some actual or imminently threatened loss of life or limb to individuals (or diminution of the structural integrity of the projects) from the use or presence of the J-M pipes since their installation in the governmental facilities.[23]

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[23] In another instructive case – *i.e., Commercial Contractors, Inc. v. United States*, 154 F.3d 1357 (Fed. Cir. 1998), the Army Corps of Engineers entered into a contract with defendant for the construction of portions of a flood control project. The defendant was found to have submitted false claims regarding certain of its building operations plus its concrete testing. As to FCA damages, the defendant argued that the government had failed to prove that it suffered any actual damages as to "backfill composition, channel length, and concrete testing." *Id.* at 1371. In response, the Federal Circuit initially held:

> The government asserts that "even a demonstration that the sections of the channel in question were completely interchangeable with appropriately-constructed sections in terms of performance would not erase [defendant's] liability." The government's argument is based on the following passage in *United States v. Aerodex, Inc.*, 469 F.2d at 1007: "The mere fact that the item supplied under contract is as good as the one contracted for does not relieve defendants of liability if it can be shown that they attempted to deceive the government agency." That passage stands for the proposition that a contractor can be held liable for submitting a false claim even if the goods it delivered are of the same quality as the goods specified in the contract, provided that the contractor acted with the requisite knowledge that the corresponding claim was false. But while the contractor may liable in that situation, it is liable only for FCA penalties, not damages . . . . In order to recover FCA damages, the government must prove that it sustained an actual loss as a result of the contractor's false or fraudulent claim.

Id. at 1371-72. It then observed that "[t]he Supreme Court has identified the proper measure of the government's loss as 'the difference between the market value of the [goods] it received and retained and the market value that the [goods] would have had if they had been of the specified quality.' *United States v. Bornstein*, 423 U.S. 303, 317 n. 13 . . . ." *Id*. at 1372. The Federal Circuit further held that:

> In some situations, however, it is not possible for an injured party to prove the loss in value caused by the contractor's deficient performance. In such cases, the Restatement of Contracts allows the injured party to recover damages computed on an alternative basis. *See* Restatement (Second) of Contracts §§ 347 cmt. b, 348 cmt. a (1981).
>
> Section 348 of the Restatement sets forth some of the alternative bases for computing damages. One of the alternatives provided is the cost of remedying defects:
>
> > If a breach results in defective or unfinished construction and the loss in value to the injured party is not proved with sufficient certainty, he may recover damages based on .

Similarly, *Humane Society* decision, 2013 WL 5753784, also cited by Plaintiffs, provides no haven for their argument. In *Humane Society*, the court denied defendant's motion for summary judgment. In that case, there were two bases for the FCA claims: (1) that the defendant had contracted to provide the government with meat from cattle that were "handled humanely" but failed to do so; and (2) that the defendant had hired a known felon at its facility which would have

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> . . the reasonable cost of completing performance or of remedying the defects if that cost is not clearly disproportionate to the probable loss in value to him.

See also id. § 348 cmt. c ("Sometimes, especially if the performance is defective as distinguished from incomplete, it may not be possible to prove the loss in value to the injured party with reasonable certainty. In that case he can usually recover damages based on the cost to remedy the defects."); *Daff v. United States*, 78 F.3d 1566, 1574–75 (Fed.Cir.1996) (affirming recovery of cost of testing and repairing defective goods).

Id. at 1372. However, the Circuit when on to place a limitation on the recovery of such damages:

> If remedying the defects in the contractor's performance includes undoing some of the contractor's improper work, however, the cost of those remedial measures may be very high. The Restatement precludes the injured party from recovering the cost of remedying defects if that cost is clearly disproportionate to the probable loss in value caused by the defects. *See* Restatement (Second) of Contracts § 348(2)(b) (1981); *see also* 3 Farnsworth, supra, § 12.13.
>
> The cost of remedying defects is not regarded as disproportionate if the defects significantly affect the integrity of a structure being built. In that setting, the injured party is entitled to recover the cost of remedying the defects despite the fact that the cost may be very high. *See* 3 Farnsworth, [*Farnsworth on* Contracts] § 12.13, at 237; Restatement (Second) of Contracts § 348 illus. 3 (1981). Stated differently, structural defects are deemed to cause such a great loss in value that the cost of remedying such defects is almost never considered to be out of proportion to that loss.

Id.

Finally, as to the issue of actual damages arising from the failures in the concrete testing, the Circuit went on to hold that:

> As with the deficiencies caused by the unsuitable composition of the backfill, the cost of remedying the deficiencies caused by [defendant's] improper concrete testing is considerable, because it requires the affected sections of the channel to be destroyed and rebuilt. In order to recover that cost, the government was required either to establish that [defendant's] deficient work significantly affected the channel's structural integrity, or to show in some other way that the cost of remedying the defective work was not clearly disproportionate to the probable loss in value caused by the defects.

Id. at 1374. After reviewing the relevant evidence, the court ruled that:

> In sum, the evidence presented by the government fails to show that the structural integrity of the channel was significantly affected by the quality control violations. Because the government did not introduce any other evidence tending to show that [defendant's] tampering with the test cylinders resulted in a channel of much less value than if [defendant] had fully complied with the cylinder testing requirements, we conclude that the very high cost of tearing down and rebuilding the supposedly affected sections - $ 4,325,670.50 (before trebling) - is clearly disproportionate to the probable loss in value caused by [defendant's] deficient work. Accordingly, we reverse the court's award of damages for the replacement of the sections of the channel allegedly affected by CCI's improper concrete work. However, we sustain the court's imposition of a $10,000 FCA penalty for the submission of a false claim certifying that the concrete work complied with the contract's quality control standards.

Id. at 1375.

rendered the facility ineligible to obtain *any* of the government contracts. *Id.* at *1, 6. As to the first basis, the court rejected the government's contention that the failure to comply with the humane treatment contract provision rendered the meat valueless; rather – in reliance on the decisions in *Bornstein*, 423 U.S. 303 (1976), and *United States v. Woodbury*, 359 F.2d 370 (9th Cir. 1966) – the court held that "the appropriate damages calculation under the United States' first theory for FCA damages is as follows: the full contract price it paid for the beef products it received from the Facility minus the value of the beef it received from humanely treated cattle." 2013 WL 5753784 at *9. However, the court shifted the burden to the defendant to demonstrate the value of the compliant beef products given that such evidence was completely under its control.[24] *Id*. at *16. As to the second basis, relying on a line of cases that where a defendant is totally ineligible to receive a government contract but nevertheless fraudulently obtains one, the court held that the correct damages figure was the entire amount paid by the government with no offset.[25] The court cited to the following language from *United States ex rel. Feldman v. van Gorp*, 697 F.3d 78, 90 (2nd Cir. 2012), in that regard:

> In short, in each of the cases cited by the defendants, the government paid for a contracted service with a tangible benefit – whether it be medical care, security on mortgages, or subsidized housing – but paid too much. The government in these cases got what it bargained for, but it did not get all that it bargained for. Thus, courts treated the difference between what the government bargained for and what it actually received as the measure of damages. Here, by contrast, the government bargained for something qualitatively, but not quantifiably, different from what it received.

The present case is not one where J-M was ineligible to be awarded the subcontracts.[26]

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[24] Here, the situation is not one where the pertinent evidence is solely within the control of Defendant. It was within Plaintiffs' control (as much as, or if not more so than, Defendant's) to dig up and test at least some of the installed J-M pipe; but that was never done. Moreover, all of J-M's available records were provided to Plaintiffs' counsel.

[25] There is a similar line of cases that, where the government awards a subsidy or grant with specific conditions and those conditions are fraudulently not met by the defendant, the government has received no benefit because it has lost the opportunity to award the grant money to a recipient who would have used the money as the government intended. *See , e.g., United States v. Rogan*, 517 F.3d 449, 453 (7th Cir. 2008) ("The government offers a subsidy . . . with conditions. When the conditions are not satisfied, nothing is due."); *United States v. Mackby*, 339 F.3d 1013, 1018-19 (9th Cir. 2003) ("Had Mackby been truthful, the government would have known that he was entitled to nothing . . . .").

[26] Similarly, in *United States ex rel. Wall v. Circle C Constr., LLC*, 813 F.3d 616 (6th Cir. 2016), the Sixth Circuit addressed the proper formula for actual damages in a case involving underpayment of electricians by a government contractor that violated prevailing wage requirements contained in the contract. In *Wall*, the Government sought the full contract price of the electrical work as a measure of damages, arguing that any work

Finally, there is an interesting line of cases (albeit *not* in the FCA context) regarding whether a plaintiff can satisfy the standing requirement when it claims injury-in-fact/economic loss on the theory that it has overpaid for an alleged defective product based on the defendant's purported misrepresentations − where the injury has not occurred and its future occurrence is speculative. In *In re Toyota Motor Corp. Unintended Acceleration Litig*., 790 F. Supp. 2d 1152, 1166 n.11 (C.D. Cal. 2011), it was observed that: "When the economic loss is predicated solely on how a product functions, and the product has not malfunctioned, the Court agrees that something more is required than simply alleging an overpayment for a 'defective' product." In *Cahen v. Toyota Motor Corp.*, 147 F. Supp. 3d 955 (N.D. Cal. 2015), plaintiffs brought a class action against the Ford Motor Company and Toyota Motor Corporation claiming that the defendants sold automobiles representing that they were safe when in fact the defendants knew that the computer technology installed in their vehicles was subject to being hacked − such that basic car functions could be controlled by individuals outside of the vehicle. Relying in part on the *In re Toyota Motor*

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completed by the underpaid employees was "tainted" and thus should be valued at zero. The Sixth Circuit rejected that contention and distinguished its pending situation from cases like *Compton* and *Roby*:

> Actual damages are the difference in value between what the government bargained for and what the government received. *U.S. ex rel. Roby v. Boeing Co*., 302 F.3d 637, 646 (6th Cir. 2002). Here, the government bargained for two things: the buildings, and payment of Davis-Bacon wages. It got the buildings but not quite all of the wages. The shortfall was $9,916. That amount is the government's actual damages. The government's accounting is more creative. First, as noted above, the government claims that all of Phase Tec's electrical work in the Kentucky warehouses is "valueless" because all of that work − the wiring, circuits, switches, everything, in every building − is tainted by Phase Tec's $9,916 underpayment to its electricians. That claim is belied by the government's own conduct in using the buildings. Moreover, this putative taint washes out easily enough with money damages, particularly the treble-strength kind available here. This case is not like *U.S. ex rel. Compton v. Midwest Specialties, Inc*., 142 F.3d 296, 304 (6th Cir. 1998), where the contractor delivered defective brake-shoe kits for jeeps, or *Roby*, 302 F.3d at 648, where the contractor delivered a helicopter with a defective transmission that caused it to crash. In those cases the goods were worthless because they were dangerous to use. Nor is this case one where some unalterable moral taint makes the goods worthless to the government. Suppose that, contrary to the contract's terms, a contractor delivers uniforms manufactured by child laborers in Indonesia or silicon chips shipped from Iran. In those cases no award of money damages could remedy the contractor's breach. But here they can: the contract required Circle C to pay electricians $19 per hour, Phase Tec paid them only $16 − and simply writing a check can make up the difference. Money damages provide a remedy for this sort of breach every day.
>
> The government also argues that it should pay nothing for Phase Tec's work because the government would have suspended its payments had it known that Phase Tec was underpaying its workers (or at least two of them, which is all the record shows here). In determining actual damages, however, the relevant question is not whether in some hypothetical scenario the government would have withheld payment, but rather, more prosaically, whether the government in fact got less value than it bargained for. And here the government has received almost of all of the value (all but $9,916, to be exact) that it bargained for with respect to the electrical work at its Kentucky warehouses.

813 F.3d at 617-18.

Corp. Unintended Acceleration decision, the district court rejected the plaintiffs' argument (that they had Article III standing because of the risk of future injury) stating "plaintiffs fail to establish economic injury in fact because they have not alleged the required 'something more' beyond the speculative risk of future harm that underlies the allegations of economic damage." *Id.* at 969-71. In affirming that decision, the Ninth Circuit observed:

> Plaintiffs have failed to sufficiently allege an injury due to overpaying for their vehicles . . . . [P]laintiffs allege that they suffered an injury because they either would not have purchased their vehicles or would have paid less for them had they known about these hacking risks. This economic loss theory is not credible, as the allegations that the vehicles are worth less are conclusory and unsupported by any facts. The district court was correct in noting that "plaintiffs have not, for example, alleged a demonstrable effect on the market for their specific vehicles based on documented recalls or declining Kelley Bluebook values . . . [n]or have they alleged a risk so immediate that they were forced to replace or discontinue using their vehicles, thus incurring out-of-pocket damages."

Cahen v. Toyota Motor Corp., 717 F. App'x 720, 723 (9th Cir. 2017).[27] This line of cases is not referenced for an argument that Plaintiffs do not have standing herein; they clearly do under the FCA.[28] Rather, those cases support the proposition that injury-in-fact (or actual damages) from the submission of the false claim cannot be established by the simple assertion (without more) that the purchaser would not have bought the products had it known of the misrepresentation.

For the above stated reasons, the Court finds Plaintiffs' contention − that J-M's pipe herein had "little to no value" because no reasonable municipality would purchase non-compliant pipe – fails as a matter of law under the undisputed facts proffered at trial and argued in the post-trial

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[27] In *Birdsong v. Apple, Inc.*, 590 F.3d 955 (9th Cir. 2009), plaintiffs brought a class action contending that defendant's digital audio player was defective because it posed a risk of hearing loss as the device was capable of producing sounds as loud as 115 decibels. The defendant included warnings on the package of each device cautioning that hearing damage could occur if the player was consistently used at high volume. The Circuit affirmed the motion to dismiss observing, *inter alia*, that plaintiffs had not alleged that they had (or imminently would have) suffered any hearing loss from the used of the device. *Id.* at 960-61. The Circuit held that plaintiffs' alleged injury was "hypothetical" because they had not claimed that they, or anyone else, had suffered or were substantially certain to suffer hearing loss due to the use of the device. The Circuit distinguished the holding in *Hicks v. Kaufman & Broad Home Corp*., 89 Cal. App. 4th 908 (2001), which allowed a class action to proceed which asserted that defendant's use of a material called "fibermesh" in the foundation of its homes created a risk of cracking and concomitant problems. The *Hicks* decision distinguished cases in which there was no history of the products failing and also noted that plaintiffs had produced expert testimony that foundations containing fibermesh would someday most likely crack badly leading to a plethora of related issues. *Id.* at 958-59.

[28] *See In re Schimmels*, 85 F.3d 416, 419 n.1. (9th Cir. 1996) ("The False Claims Act requires a court to award not less than $5,000 and not more than $10,000 for each false claim or statement submitted to the government, even if no damages were caused by the false submissions.").

briefs. Actual damages under the FCA must be established by actual evidence, not merely by an argument. And the Plaintiffs bear that burden of proving actual damages in an FCA case. *See United States ex rel. Harrison v. Westinghouse Savannah River Co.*, 352 F.3d 908, 923 (4th Cir. 2003).

B. Early Failure and the Need to Be Replaced at Great Expense

1) Introduction

Plaintiffs contend that in the Phase Two trial they proffered a method of quantifying the value of the J-M pipe they received by establishing that "the pipe would fail early and need to be replaced at great expense," from which the jury could conclude that the pipe had "little to no value." *See* Pl.'s Supp. at 1, Docket No. 2821. A number of insurmountable problems arise as to that contention which will be discussed in turn herein. First, the proffered method is not entirely clear; it does not conform to any formula heretofore established for calculating actual damages in an FCA case; and it is inconsistent with the Phase Two jury instructions. Second, even accepting Plaintiffs' method on its face, it incorporates the concept of consequential damages which is not normally available in an FCA case and, certainly, not in the Phase Two context for the governmental entities herein. Third, assuming *arguendo* that early failure is a reference to the differences in longevity as between compliant pipe and J-M's noncompliant pipe (with compliance based upon the three tests/standards litigated in Phase One), Plaintiffs failed to present evidence in the Phase Two trial as to a usable longevity figure for pipe that complied with the three tests/standards litigated in Phase One for comparison purposes. Fourth, the Plaintiffs did not present sufficient admissible evidence as to any calculable amount of reduced longevity as to non-compliant J-M pipe in comparison compliant pipe because: (a) Plaintiffs have conceded that "nobody was able to quantify the value" *see, e.g.,* 2/20/19 Hr. Trans. at 11, Docket No. 2822-2 at 5 of 12; (b) the Court would grant J-M's post-trial renewed request under *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993), to strike Plaintiffs' experts' testimony (but would do so only in regards to their attempts to provide a methodology of calculating reduced longevity as to J-M pipe as a result of the testing failures found in the Phase One trial); (c) even if the Court were not to strike any portion of Plaintiffs' experts' testimony, that testimony did not, and indeed could not, establish a viable way to calculate a reduction in longevity for non-compliant J-M pipe; and (d) while Plaintiffs have continually argued that the J-M pipe had no value, aside from the disputed evidence from Plaintiffs' experts, the remaining evidence clearly demonstrated a dearth of actual

damages because: (i) the pipe had (and is continuing to have) value for the Plaintiffs and (ii) Plaintiffs have taken no action which firmly demonstrates that Plaintiffs have suffered any actual measurable injury in regards to the J-M pipe.

2) Plaintiffs' Delineated Formula for Actual Damages Is Uncertain and Incorrect

Plaintiffs' formula/methodology for establishing actual damages apparently requires demonstrating the following three elements: (1) that the J-M pipe would "fail early," (2) that it would need to be replaced, and (3) that such replacement would be at great expense. Plaintiffs' contention is initially nebulous and thereafter incorrect under FCA law.

Plaintiffs' first element (*i.e.* it must be shown that the J-M pipe would "fail early") presumably requires proof that there is a *measurable* difference[29] in terms of longevity between pipe that is compliant with the testing criteria that was the subject of the Phase One trial (and its concomitant jury verdict) and the J-M pipe they received. That would be consistent with the jury instructions given to the jury at the Phase Two trial[30] and with the standard "benefit of the bargain"

[29] The existence of a *measurable* difference between compliant and non-compliant pipe (based upon the three tests litigated in Phase One) is essential for purposes of calculating actual damages herein. While the result can be expressed in the form of units of time (*e.g.* 100 years versus 50 years) or comparative periods of time (*e.g.* compliant pipe will last 25% longer than non-compliant pipe), there must be a basis for quantifying the difference in order to reach a determination as to the amount of actual damages.

[30] As stated in the Phase Two Jury Instructions:

> As to actual damages, Plaintiffs contend that, as a result of J-M's failure to manufacture and test its pipe in a manner that assured that it had the quality, strength and durability as required under the applicable industry standards, the pipe Plaintiffs purchased will fail sooner than pipe that conformed to the applicable industry standards and thus will have to be replaced sooner. * * * *
>
> Each Plaintiff has the burden of proving, for each of its projects, that J-M's failure to manufacture or test its pipe in a manner that assured that it uniformly had the quality, strength, or durability that AWWA C900/905 and/or UL 1285 required caused the physical properties of the J-M pipe it received to be less than what they would have been if J-M had, instead, manufactured or tested that pipe in a manner that assured it uniformly had the quality, strength, or durability required.
>
> * * * *
>
> I have told you that each Plaintiff must prove that the pipe it received was worth less than what it was promised. This requires you to compare two values: the value of the pipe received and the value of the pipe each Plaintiff was promised and paid for. In considering whether each Plaintiff received the benefit of its bargain, you must determine the value the Plaintiff has obtained from the pipe since it was delivered and installed. If a Plaintiff proves by a preponderance of the evidence that J-M's failure to manufacture or test its pipe to assure that it uniformly had the quality, strength, or durability the AWWA or UL standards required caused the physical properties of each Plaintiff's pipe to be different from and less valuable than the pipe J-M promised to the point that the Plaintiff received no value from the pipe, you must find the value of that pipe is zero and the Plaintiff lost the value it bargained for. If, for any project, you find that a Plaintiff has proven it received some value, but less than J-M represented to it, you must use that value in determining the difference between it and the value that Plaintiff paid for. That difference is the value that Plaintiff lost. If you find that a Plaintiff has not proven that it received

measure of damages in the case of nonconforming goods.[31]

The next element (*i.e.* it must be shown that that the J-M pipe would need to be replaced) is somewhat confusing. If the Plaintiffs could prove that the J-M pipe it received would fail sooner than compliant pipe *in a measurable way* (*e.g.*, that it would only last 50 years rather than 100 years), why would it be necessary for the Plaintiffs to also show that the pipe needed to be replaced? It is unclear what is meant by the word "need" in Plaintiffs' contention − *i.e.* is it an immediate need, an eventual need, a theoretical need, is the need dependent upon a showing of a precise date for an expected failure, etc. Arguably the "need to be replace" element would be superfluous, *so long as* Plaintiffs could prove a *measurable* reduction in longevity. Conversely, if the Plaintiffs' were unable to prove a measurable reduction in longevity, then the "need" element could never be sufficiently met in that situation where, as noted above, there is no imminent threat to the public safety or facilities.[32]

Finally, as discussed in the next section, *infra*, to the extent that Plaintiffs' damages formula incorporates, includes or is dependent upon the notion that the costs of replacing the nonconforming J-M pipe (other than the costs of new pipe itself) would result in great expense to the Plaintiffs, that metric is wrong as a matter of law.

3) Consequential Damages Are Not Recoverable under the FCA Statutes Herein

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> less than the value it would have had based upon J-M's representation of compliance with AWWA C900/905 or UL 1285, you must award no damages.

See Docket No. 2756 at 3, 9 of 11.

[31] As stated in *Feldman*, 697 F.3d at 87-88:

> There are generally two ways of determining damages in such cases. First, if the non-conforming goods or services have an ascertainable market value, then damages are measured according to the "'difference between the market value of the product [the government] received and retained and the market value that the product would have had if it had been of the specified quality.'" *United States v. Science Application Int'l Corp.*, 626 F.3d 1257, 1279, 393 U.S. App. D.C. 223 (D.C. Cir. 2010) (quoting *United States v. Bornstein*, 423 U.S. 303, 316 n.13, 96 S. Ct. 523, 46 L. Ed. 2d 514 (1976)) (alterations omitted). If the non-conforming goods' or services' market value is not ascertainable, then the fact-finder determines the amount of damages by calculating the difference between "the amount the government actually paid minus the value of the goods or services the government received or used," as judged by the fact-finder. *Id.*

[32] One of J-M's pretrial motions in limine sought to exclude reference by Plaintiffs as to imminent failure of the J-M pipe or other clear and present danger to health and safety of the public. *See* Docket No. 2521. The bases for that motion was that "Plaintiffs' experts did not disclose any such opinions in their two rounds of expert reports, nor in their depositions or any of Plaintiffs' subsequent briefing, rendering such opinions automatically excludable under Federal Rules of Civil Procedure 26 and 37." *Id.* at 3 of 9. After extensive briefing and argument, this Court granted that motion finding that none of Plaintiffs' experts had previously proffered any such evidence or testimony. *See* Docket No. 2628 at 2 and 15 of 35.

Initially, it should be observed that the notion of "replacement costs" can simply mean the price of purchasing a new product to replace the non-conforming one. That could occur even under the traditional benefit of the bargain rule where it is found that the non-conforming product was of no actual use to the Government and, hence, the damages to the Government would be either the full price paid for the product or the current cost to purchase the compliant item. However, there are conceptually other expenses which can arise from actions taken to replace the non-conforming product. Such other expenses can include the costs of testing the newly delivered goods, the price of removing the non-conforming product from the system and substituting the new product, etc. The question arises as to whether these latter types of replacement costs are allowable in the context of awarding actual damages in an FCA case. This Court has held that, in this case as to the present exemplar Plaintiffs, they are not. As noted by the Supreme Court in *Cook County v. United States ex rel. Chandler*, 538 U.S. 119, 131 (2003):

> The FCA has no separate provision for prejudgment interest, which is usually thought essential to compensation . . . . Nor does the FCA expressly provide for the consequential damages that typically come with recovery for fraud, *see* Restatement (Second) of Torts § 549(1)(b), and Comment d (1976).

In *United States v. Aerodex*, 469 F.2d 1003 (5th Cir. 1972), defendant entered into a $27,000 contract to sell to the Navy 300 specific aircraft engine bearings (*i.e.* P/N 171815) that were required to be subject to 100% final inspection. *Id.* at 1006. The defendant took non-compliant bearings, reworked them to look like the P/N 171815 product, marked them as P/N 171815 bearings, and supplied them without the requisite inspection. Upon discovery, the Navy removed the bearings from the aircraft engines and replaced them with compliant parts at a cost of $160,919.18. In the FCA action that followed, the government was awarded $381,838.36 which was calculated as follows: (a) the sum of $189,919.18 was reached by adding the $27,000 contract price for the valueless bearings to the replacement costs of $160,919.18; (b) that sum was doubled as provided for under the then-current FCA provisions; and (c) $6,000 (consisting of a $2,000 civil penalty for each of three invoices) was added on top of the doubled sum. *Id.* The Fifth Circuit reversed the award of the replacement costs of $160,919.18 stating:

> Upon careful analysis, we hold that the language of the False Claims Act does not include consequential damages resulting from delivery of defective goods. The statute assesses double damages attributable to the "act," which in this case is the submission of the false vouchers. The submission of these vouchers was not the cause of the government's consequential damages. The delivery and installation of the bearings in the airplanes, not the filing of the false claim, caused the

consequential damages.

Id. at 1011.

The *Aerodex* decision was discussed in congressional hearings (*see*, *e.g.*, Subcommittee on improvements in Judicial Machinery of the Committee on the Judiciary, U.S. Sen., 96th Cong., First Session on S. 1981 at 10-11 (Nov. 19, 1979)), and eventually lead to proposals to amend the federal FCA statute (*i.e.* 31 U.S.C. § 3729) to specifically "permit the Government to recover any consequential damages it suffers from the submission of a false claim." *See* False Claims Amendments Act of 1986, P.L. 99-562, 99th Cong., 2nd Sess. 1986, S. Rep. No. 345 at 19. However, those proposals were never adopted. Instead, as noted by the Supreme Court:

> The treble damages provision was, in a way, adopted by Congress as a substitute for consequential damages. The Senate version of the bill proposed consequential damages on top of treble damages, while the House version proposed consequential damages plus double damages. *See* S.Rep. No. 99–345, p. 39 (1986) (hereinafter S. Rep.); H.R.Rep. No. 99–660, p. 20 (1986) H.R.Rep. No. 99–660, p. 20 (1986), U.S. Code Cong. & Admin. News 1986, p. 5266. Ultimately, the Senate's treble figure was adopted and the consequential damages provision dropped.

Cook County, 538 U.S. at 131, n.9.

While there have been a few courts which had previously awarded repair/replacement costs as part of actual damages in an FCA case,[33] this Court could not locate any federal, California, Nevada, or Virginia court decision which did so after the Supreme Court's decision in *Cook County*.[34] Conversely, following the holding in *Cook County*, a number of courts have expressly held that the FCA does not provide for consequential damages. *See*, *e.g.*, *Sanders v. Allison Engine Co*., 703 F.3d 930, 947 (6th Cir. 2012). Additionally, the Court has found a few federal cases from Virginia and California which have commented that the FCA does not include consequential damages as part of actual damages within the statute. *See United States ex rel. Bunk v. Birkart*

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[33] *See*, *e.g.*, *Daff v. United States*, 31 Fed. Cl. 682 (Fed. Cl. 1994), *aff'd* 78 F.3d 1566 (Fed. Cir. 1996); *BMY-Combat Sys. Div. of Harsco Corp. v. United States*, 44 Fed. Cl. 141 (Fed. Cl. 1998).

[34] It is noted that, unlike the federal, California, Nevada and Virginia FCA statutes, there are some states whose FCA statute specifically provides for consequential damages as part of its definition of actual/recoverable damages. *See e.g.* N.Y. Consol. Laws, Fin. Serv. § 189(1)(h) ("any person who . . . [violates the New York FCA] shall be liable to the state or a local government, as applicable, for a civil penalty . . . plus three times the amount of all damages, including consequential damages . . . ."); *United States ex rel. Bilotta v. Novartis Pharms. Corp*., 50 F. Supp. 3d 497, 544-45 (S.D.N.Y. 2014); *Massachusetts v. Schering-Plough Corp*., 779 F. Supp. 2d 224, 234 (D. Mass. 2011) ("Most notably, the MFCA allows for consequential damages, whereas the FCA excludes consequential damages. *Compare* Mass. Gen. Laws ch. 12, § 5B, *with* 31 U.S.C. § 3729 (2000).").

Globistics GmbH & Co., No. 1:02cv1168 (AJT/TRJ), No. 1:07cv1198 (AJT/TRJ), 2011 WL 13227940, at *1 (E.D. Va. July 5, 2011) ("the Court concludes that consequential damages are not recoverable as a matter of law under the False Claims Act" citing to the *Cook County* case); *United States ex rel. Shutt v. Community Home and Health Care Services, Inc.*, No. CV 04-02075-MMM-(SSx), 2006 WL 8447779, at *7 (C.D. Cal. Dec. 26, 2006) and, on the appeal in *Shutt*, the Ninth Circuit observed that "[t]reble damages have a compensatory aspect, serving remedial purposes over and above any punitive objectives and in some ways were adopted as a 'substitute for consequential damages.' [citing to] *Cook County* . . . ." 305 Fed. Appx. 358, 360 (9th Cir. 2008).[35]

For the above stated reasons, this Court held that consequential damages in the form of the costs of replacing non-compliant product is not recoverable in FCA cases where the applicable state statute is modelled after the federal FCA, which does not specifically provide for the inclusion of consequential damages as part of "actual damages" under the Act.

4) Inadequate Evidence of a Useable Longevity Figure for Compliant Pipe

The jury in the Phase One trial did not find any longevity figure for compliant pipe. *See generally* Verdict, Docket No. 1794. The evidence at the Phase Two trial did not show that any of the Plaintiffs had actually contracted with J-M (or anyone else) as to a specific longevity figure for the J-M pipe.[36] *See*, *e.g.*, testimony cited in footnote 77 of J-M's initial Motion for Judgment

[35] Obviously, if the contract between the governmental entity and the defendant called for the defendant to provide not only the component part but also to install that part into a larger product or system where the part is essential to the operation of that system, there might be an argument that, if the part significantly fails, the defendant must bear the costs of not only the price of obtaining a conforming component but also the costs of removing the defective component which the defendant initially installed and replacing it with the newer item. *See, e.g., Roby*, 302 F.3d at 346-47; *Commercial Contractors, Inc.*, 154 F.3d at 1371-74.

[36] J-M has argued that because the contracts between J-M and the Plaintiffs (or between the Plaintiffs and the general contractors for the projects who in turn contracted with J-M to provide the pipes) did not specify any longevity figure or requirement as to the pipes, Plaintiffs cannot recover for any purported loss of longevity as actual damages under the FCA benefit of the bargain doctrine. *See, e.g.,* Renewed JMOL Motion at 9-18, Docket No. 2809 at 18-27 of 55. This Court initially rejected that argument finding that: (1) there was no dispute that the applicable contracts did incorporate certain standards as to the specified pipes and, to the extent that those standards could establish certain longevity features or results, that would be sufficient for purposes of the benefit of the bargain doctrine; and/or (2) there was evidence that J-M's brochures and cut sheets contained representations as to compliance with standards which, if reasonably relied upon, could also serve as a basis for a longevity requirement, but again only if the standards assured some longevity characteristics. However, the problem now for the Plaintiffs is that the evidence they proffered at the Phase Two trial did not establish any actual or usable longevity figure(s) for pipe that complied with the three litigated standards. *See generally, e.g.,* 11/14/18 Tr. Trans. at 8419, 8430-32, Docket No. 2871.

In response to J-M's contention, Plaintiffs' counsel raised an argument that the present situation was similar to one where "if a person bought a pair of shoes represented to be 'hand-made' and was given machine-made shoes that fell apart after a week, the buyer would surely be entitled to recover for the diminished lifespan even if the contract never mentioned lifespan." *See* Opp'n at 5, Docket No. 2814 at 8 of 12. Plaintiffs' hypothetical is

as a Matter of Law, Docket No. 2729 at 28-29 of 37. Plaintiffs' counsel (*i.e.* Eric Havian) conceded this point during motions in limine argument before trial,[37] and after the close of evidence at trial.[38] Moreover, during the relevant period when the Plaintiffs purchased the J-M pipe, J-M's express warranty as to its pipes was only for one year, and that was the standard industry practice at that time.[39] *See* Testimony of Chuck Clark, 10/23/2018 Tr. Trans. at 3810-11, Docket No. 2842.

At trial, it was undisputed that the organizations which established the standards and the three relevant tests on which the Phase One jury's verdict rests did not themselves indicate that meeting the testing requirements would result in any specific longevity figure for the compliant PVC pipe. Plaintiffs' experts all testified as to that fact (or at least did not dispute it);[40] and, in the

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incomplete and not entirely germane as to the matters litigated in the Phase Two trial. Rather, a more complete hypothetical and inquiry would be: if a person bought a pair of shoes that were represented to be "hand-made" and therefore would last longer than "machine-made" footwear (at least about five years), and, after wearing the shoes every day for one year, he discovers that they were in fact machine-made but still continues to wear the shoes every day thereafter without incident, what would that person's damages be under applicable FCA law?

[37] *See, e.g.,* Transcript of September 7, 2018 pre-trial proceedings at 10, Docket No. 2829 at 10 of 265 ("So, your Honor, we and J-M agree. Nobody bargained for a particular life span of the pipe. Our clients don't say we bargained for a particular life span."); *see also,* Transcript of September 11, 2018 pre-trial proceedings at 18, Docket No. 2809-10 at 3 of 5 ("we are not seeking to sort of establish for purposes of the trial that 100 years was a promise that was made and that's part of the bargain. That's not our position, never has been.").

[38] *See, e.g.,* 11/14/18 Tr. Trans. at 8431, Docket No. 2871:

> THE COURT: . . . if the contracts themselves do not specify longevity −
>
> MR. HAVIAN: Well, they specify compliance with the standards.
>
> THE COURT: Compliance with the standards, but the standards themselves do not indicate a period of time as to longevity.
>
> MR. HAVIAN: That's right. And if the pipe failed in a week, under this theory if it has to be − first of all, your Honor, if it has to be in the contract and/or it has to be in the standards, then we are done.

See also statement of Plaintiffs' counsel, 11/14/18 Tr. Trans. at 8634, Docket No. 2858, "So at some point, the court, I think, has to come to grips with whether it's going to either squarely accept or reject J-M's argument that unless longevity is in the contract or in the standards, *which the parties agree it's not*, then plaintiffs can't recover damages." (emphasis added)).

[39] In 2010, after this lawsuit was filed and unsealed, J-M issued a limited 50-year warranty covering its pipe, which was made retroactive. *See* Testimony of Chuck Clark, 10/23/18 Tr. Trans. at 3809-11, Docket No. 2842; Testimony of David Speer ("Speer Test."), 10/12/18 Tr. Trans at 1310-11, Docket No. 2848.

[40] *See, e.g.,* Testimony of James Paschal ("Paschal Test."), 10/18/18 Tr. Trans. at 2694-95, Docket No. 2849:

> Q. But in point of fact the standards themselves, there is no standard that requires a certain service life, right? True or not?
>
> A. Specifically within the standards we've been discussing today, that's correct. * * * *

Phase Two trial, Plaintiffs' counsel conceded the issue.[41] Thus, there was no evidence at trial which showed that any of the organizations (that instituted the standards, formulated the tests for meeting the standards, or monitored compliance with the standards) established any longevity figure for pipe that met the three testing standards that are involved in this lawsuit during the relevant period of time involved in this action. Indeed, as to one of the standards (*i.e.* the hydrostatic design basis), it was specifically noted that the applicable test (*i.e.* ASTM D 2837[42]) measured the long-term strength of the pipe material and referenced the term "50-year strength value," but it was further explained that:

> The term "50-year strength value," as used in ASTM D 2837, is a mathematical extrapolation that is useful in the context of developing an HDS or HDB. It does not constitute a representation that any material with such a value will perform under actual use conditions for that period of time."

See Plastics Pipe Institute TR-3/2002 HDB/PDB/SDB/MRS Policies: Policies and Procedures for Developing Hydrostatic Design Bases (HDB), Pressure Design Bases (PDB), Strength Design Bases (SDB), and Minimum Required Strengths (MRS) Ratings for Thermoplastic Piping Materials for Pipe ("PPI TR-3") at iii, Tr. Ex. UL-021, admitted 10/17/18, Docket No. 2804-2 at 35 of 35.

> A. I think the only statement in the standards would be in reference to doing the extrapolation to 50 years in [P]PI TR-3 where it says that is not necessarily intended to mean that's the useful life of the pipe. * * * *
>
> Q. It remains true that no standard requires a certain service life, true or not?
>
> A. That's true.

See also Testimony of Dale Edwards ("Edwards Test."), 10/19/18 Tr. Trans. at 3087, Docket No. 2708:

> Q. Okay. Now, in point of fact, is it true that according to PPI TR-3, that is according to the PPI technical guidance that is used to certify an HDB of 4,000 PSI, according to them, long-term HDB values are not an actual prediction of actual longevity, correct?
>
> A. Yes, that's in the TR-3.

See also Testimony of Bruce Allen Davis ("Davis Test."), 10/12/18 Tr. Trans. at 1496, Docket No. 2837:

> Q. In fact, it is very difficult even to determine how long compliant pipe, good pipe − it is very difficult to determine how long it lasts; correct?
>
> A. I would say that's correct.

[41] *See* footnote 38, *supra*; *see also* 11/14/18 Tr. Trans. at 8419, Docket No. 2871 ("We told the jury − we argued to the jury the standards don't address longevity. So, if the issue were just that, if [Defendant's counsel] was right, that unless you see longevity in the standards or in the contracts, the case is over.").

[42] *See* ASTM International Designation: D 2837-01, Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Materials ("ASTM D 2837"), Tr. Ex. 20170 at 1 of 14, admitted October 17, 2018, Docket No. 2804-1 at 14 of 35.

This absence of a usable longevity figure for compliant pipe is not surprising since: (1) PVC pipes for civic water distribution initially were utilized in the United States in the 1950's, with standards and specifications developed in the 1960's and, hence, there has not been any actual experience with how long compliant pipe will last in the field;[43] (2) as will be discussed, *infra*, the primary test for quantifying long-term strength of PVC pipe material (*i.e.* the HDB pursuant to ASTM D 2837) incorporates "design/safety factors" such that the pipes are planned for utilization in applications where the actual pressures/stresses will be substantially below their tested/rated long-term strength capacities; and (3) as will also be discussed below, the three tests that were the subject of the Phase One trial concerned long-term strength and the short-term strength of PVC pipe material and those test results, while having some relationship to longevity, do not have any mathematical or measurable correlation to the longevity of the pipe.

However, evidence was presented at the Phase Two trial that there is some expectation within the pipe industry that PVC pipe will last at least 100 years,[44] and certain of the Plaintiffs' representatives held that belief. Some of J-M's brochures referenced that figure. Nevertheless, as noted *supra*, the standard industry practice (and as stated by J-M in some of its brochures) was only to offer a one-year express warranty as to the C900/C905 PVC pipe. Additionally, there was also evidence that, within the industry and also as to certain of the Plaintiffs, different longevity expectations were expressed ranging from 50[45] to over 150 years. While the 100 years figure was more predominant, there was no consensus. More importantly, the industry's and Plaintiffs'

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[43] *See* Paschal Test., 10/18/18 Tr. Trans. at 2600, Docket No. 2849:

> Q. Isn't it true that you have no data, no actual data, that says pipe lasts exactly a hundred years and then goes − fail.
>
> A. I don't think there's any pipe that's been installed for 100 years.
>
> Q. * * * There's no data that actually says that, right?
>
> A. There's no data of pipe that's actually failed at 100 years.
>
> Q. There's no data that even goes to 100 years, PVC pipe hadn't been around that long, correct?
>
> A. That's what I said, yes.

[44] One of J-M's experts (*i.e.* Steve Folkman) testified as to a study published in 2014 where PVC pipe from around the country (that had been in constant use for over 50 years) had been dug-up, tested, showed no significant degradation over time − from which that expert concluded that "100 years is a reasonable estimate of the minimum expected life of [PVC] pipe that's properly manufactured and properly installed." *See* Folkman Test., 10/25/18 Tr. Trans. at 4620-23, Docket No. 2852.

[45] *See e.g.* Speer Test., 10/12/18 Tr. Trans at 1310-11, Docket No. 2848 (as to Plaintiff City of Norfolk, Virginia).

longevity expectations were not based on compliance with the three tests that were actually litigated in the Phase One trial. Also, as noted above, no longevity figure was included as part of any of the relevant contracts involved herein. Plaintiffs' counsel conceded that the Plaintiffs' subjective expectations as to pipe longevity herein could not be utilized in determining actual damages.[46]

Further, none of Plaintiffs' experts conducted any experiments, tests or undertook any other means of attempting to establish a longevity figure for compliant PVC pipe. Instead, they merely assumed some figure for purposes of this litigation.[47]

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[46] During the jury deliberations and in response to a jury question, Plaintiffs' counsel stated: "The parties' subjective expectations are irrelevant. It is one of the rare occasions where we agree with J-M . . . . And they say evidence of the parties' subjective expectations of pipe longevity cannot be considered in determining any actual damages." *See* 11/14/18 Tr. Trans. at 8414, Docket No. 2871.

Plaintiff's counsel stated that, in regards to the question as to whether there was anything in the literature that said that PVC pipe will last *exactly* 100 years, "[w]e'll stipulate it's not a hundred years exactly." *See* Tr. Trans. at 4626-27, Docket No. 2852.

[47] As testified by Paschal:

> Q. Now, . . . you've assumed 100 years, right? In all of your statements of how long the pipe lasts, assume that regular – a standard pipe will last all the way up to 100 years and not a day later, right?
>
> A. For purposes of the calculation, yes, it has to be a fixed number. * * * *
>
> Q. When it comes to when exactly, when exactly pipe is going to fail, the fact of the matter is that you don't actually offer an opinion in your report on that, do you? You just use a number that you assume, correct?
>
> A. As I said, it's based on the 100-year expectation, yes.
>
> Q. . . . . You don't actually express an opinion on the question of how long pipe that complies to standards actually will last, there is no such opinion in your report, true?
>
> A. I don't believe so, no.

See Paschal Test., 10/18/18 Tr. Trans. at 2698-700, Docket No. 2849.

As stated by Davis:

> Q. And isn't it true that you have never actually offered an opinion that calculates the longevity of pipe; correct?
>
> A. As far as I recall, I don't recall doing a calculation to say what the longevity would be on this specific stick of pipe . . . .
>
> * * * *
>
> Q. . . . . Isn't it true that you said in your first report that the PVC pipe that was compliant pipe, everything was hunky-dory, would have an estimated lifetime of between 50 and a hundred years?
>
> A. I said that would be a reasonable estimate of a lifetime. Fifty to a hundred years.
>
> Q. And this was in your report; right?
>
> A. That's correct.
>
> Q. Did you review that to make sure it was complete and accurate before you submitted that report?
>
> A. Again, as we said − as you just said, it is difficult to put a time on that, a firm time. So that is

Under the relevant benefit of the bargain calculation for actual damages in this case, there needs to be a comparison between the market value of the product the government received and retained and the market value that the product would have had if it had been of the specified quality;[48] or, in certain cases where the market value of the conforming goods or services is impossible to determine, courts have calculated damages as the amount the government actually paid minus the value of the goods or services the government received or used.[49] Hence, in the present situation, it is necessary to evaluate the value of the J-M pipe which the Plaintiffs received which ultimately requires the Plaintiffs to show the difference in terms of longevity between compliant PVC pipe and non-compliant PVC pipe. However, without a useable figure for compliant pipe, that calculation cannot be done in any meaningful way. Hence, that is one reason (amongst several) why there is no way for a reasonable jury to reach an amount for actual damages in this case which would not be based on pure speculation and/or simply incorrect as a matter of law.

5) *Even Assuming Arguendo the Existence of a Longevity Figure for Compliant PVC Pipe, Plaintiffs Failed to Establish the Existence of an Actual and Viable Method or Formula for Calculating the Diminished Longevity of Non-Compliant J-M Pipe*

a) Plaintiffs' Virtual Concession of Their Inability to Quantify the Value of Non-Compliant Pipe

At various points during and after the Phase Two trial, Plaintiffs' counsel virtually conceded their inability to quantify any purported diminution of value of the J-M pipe during the relevant periods. For example, in argument to the Court on J-M's Renewed JMOL Motion, Plaintiffs' counsel admitted: "First of all, nobody was able to quantify the value. I mean, they say it was our burden to quantify the value of use. Well, we've established there's really no way to

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the best reasonable, accurate estimate that you can get.

See Davis Test., 10/12/18 Tr. Trans. at 1492-93, 1496, Docket No. 2837.

Edwards testified that he assumed a benchmark number for compliant pipe to be 100 years based upon industry claims. *See* Edwards Test., 10/19/18 Tr. Trans. at 3008, Docket No. 2708. He attempted to further state that he also reached that number based upon a stress-regression equation, but the Court struck that portion of his answer because he had failed to include that evidence in his expert reports prior to trial. *Id.* at 3010-17.

[48] As stated by Plaintiffs' counsel: "MR. HAVIAN: . . . . On this point our theory of damages would be the difference in value between the pipe we were promised which was compliant pipe and the pipe we received which was noncompliant pipe." 2/20/19 Hr. Trans. at 8, Docket No. 2822-2 at 4 of 12.

[49] As stated by Plaintiffs' counsel: "MR. HAVIAN: . . . . What we are seeking now, because the Court has limited us, is the price of the pipe. And the only thing we are seeking is the difference between the value of the pipe as promised and the value of the pipe as delivered." 11/6/18 Tr. Trans. at 6522, Docket No. 2866.

quantify that." *See* 2/20/19 Hr. Trans. at 11, Docket No. 2822-2 at 5 of 12.

In the initial closing argument to the jury, Plaintiffs' counsel seeming abandoned any benefit of the bargain bases for the actual damages calculation (which required determining the value of the J-M pipe which the Plaintiffs received). Instead, he proceeded to argue a theory of recovery that: (a) urged the jury to ignore the issue of determining the longevity of J-M pipe; (b) was inconsistent with the jury instructions; and (c) was premised on two contentions where the Court had previously ruled against the Plaintiffs – *i.e.* (1) that the jury could consider the high cost of removing and replacing all of the J-M pipe in the ground (which cost would "dwarf" the price of the pipe itself[50]), and (2) that there was evidence that the J-M pipe had zero value to the Plaintiffs.[51]

In the end, Plaintiffs failed to provide the Phase Two jury with admissible evidence from which that jury could fashion a correct and non-speculative way of quantifying the value of non-compliant J-M pipe.

b) The Court Grants J-M's Post-Trial *Daubert* Motion as to the Testimony of Plaintiffs' Experts – Edwards, Paschal, Davis and Lehman – in Regards to the

[50] There was testimony at the Phase Two trial that the cost of replacing the J-M pipe in certain of the projects would be about 8 times the cost that Plaintiffs paid for the project at the time of their installation and between 40 to 50 times what J-M was paid for the pipe. *See, e.g.,* Testimony of James Cathcart, 10/24/18 Tr. Trans. at 4060-61, Docket No. 2718.

[51] As stated by Plaintiffs' counsel in his closing argument:

> . . . . We use the test results we had. We created some predicted times to failure. Our experts worked with the – all of the data that we had from J-M on the three tests that the jury said were the relevant, three just those three, all the data we had from those, and they created some predicted times to failure. *At this point, those don't matter, doesn't matter when the pipe – because that's not the question we have anymore is what will it cost to replace the J-M pipe. That's not the question before you.* We're only asking for what is the value of the pipe that we got. What is the value of the pipe that we got.
>
> * * * *
>
> *Our answer to that question is the value we got was zero.* Actually, the real answer is it's a negative value and why is that? Well, J-M made a point of the fact that water's flowing through the pipe and that's true. And you get some value out of that and that's true. But let's say instead of the 43 percent failures within 100 years that Mr. Edwards predicted and the 27 percent that Mr. Paschal suggested, some lesser amount fails. *I don't know. Ten percent, 15 percent, maybe you're skeptical of those numbers. But the cost of the pipe compared to the huge expense of digging it up, even if it's a small amount is going to dwarf the cost the pipe; the cost of the pipe is a tiny fraction of what it costs to replace the pipe. So on balance is that pipe worth anything to us? No, no.*
>
> What's the difference in value – that's the question the court has asked you to answer – what is the difference in value between what we paid and what we got? And you heard those plaintiffs testify if they had this to do over, they'd pay zero for that pipe because, on balance, those failures are going to swamp any benefit from when the pipe is actually in the ground and carrying water. So what we urge you to decide is the value we got was nothing. We got negative value.

See 11/6/18 Tr. Trans. at 6637-39 (emphasis added).

Issue of the Longevity of Non-compliant PVC Pipe

i) *Post-Trial Daubert Motions*

J-M has requested a post-trial *Daubert* review as to parts of the Plaintiffs' experts' trial testimony. Conceptually, that can be done. In *Goebel v. Denver & Rio Grande Western R.R.*, 215 F.3d 1083, 1087 (10th Cir. 2000), it was observed that: "The district court may also satisfy its gatekeeper role when asked to rule on a motion in limine, on an objection during trial, or on a post-trial motion so long as the court has sufficient evidence to perform 'the task of ensuring that an expert's testimony both rests on a reliable foundation and is relevant to the task at hand.' *Daubert*, 509 U.S. at 597." Likewise, in *Drake v. Delta Air Lines, Inc.*, No. 94-CV-5944(FB)(RML), 2005 WL 1743816 at *8 (E.D.N.Y., July 21, 2005), it was noted that:

> [A]s the Eighth Circuit has appropriately advised:
>
> > It is far better where, in the mind of the district court, there exists a close case on relevancy of the expert testimony in light of the plaintiff's testimony to allow the expert opinion and if the court remains unconvinced, allow the jury to pass on the evidence. Depending on the verdict, the trial court can always refer to Federal Rule of Civil Procedure 50(b) and grant a judgment as a matter of law or a new trial.
>
> *Lauzon v. Senco Products, Inc.*, 270 F.3d 681, 695-96 (8th Cir. 2001). Accordingly, although prior to trial the Court ruled that Drake could introduce Dr. Mann's expert testimony, *see* September 3, 2002, Tr. at 22-23 ("It may be a thin case ... but I do think that if I were to preclude the plaintiff from going forward and striking the expert's testimony that there would be a significant risk of having to try this case in the future ...."), the Court now reevaluates whether Dr. Mann's testimony should have been excluded under *Daubert.*

As held by the Supreme Court in *Daubert*, under Federal Rule of Evidence 702, "the trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable." 509 U.S. at 589. As further stated in *Daubert*:

> Faced with a proffer of expert scientific testimony, then, the trial judge must determine at the outset, pursuant to [Fed. R. Evid.] Rule 104(a), whether the expert is proposing to testify to (1) scientific knowledge that (2) will assist the trier of fact to understand or determine a fact in issue. This entails a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue.

Id. at 592-93. While not creating a checklist *per se*, the Court went on to focus upon four factors:

> Ordinarily, a key question to be answered in determining whether a theory or technique is scientific knowledge that will assist the trier of fact will be whether it can be (and has been) tested. "Scientific methodology today is based on

> generating hypotheses and testing them to see if they can be falsified; indeed, this methodology is what distinguishes science from other fields of human inquiry." . . . .
>
> Another pertinent consideration is whether the theory or technique has been subjected to peer review and publication. Publication (which is but one element of peer review) is not a sine qua non of admissibility; it does not necessarily correlate with reliability, . . . , and in some instances well-grounded but innovative theories will not have been published . . . . Some propositions, moreover, are too particular, too new, or of too limited interest to be published. But submission to the scrutiny of the scientific community is a component of "good science," in part because it increases the likelihood that substantive flaws in methodology will be detected.
>
> Additionally, in the case of a particular scientific technique, the court ordinarily should consider the known or potential rate of error, . . . , and the existence and maintenance of standards controlling the technique's operation . . . .
>
> Finally, "general acceptance" can yet have a bearing on the inquiry. A "reliability assessment does not require, although it does permit, explicit identification of a relevant scientific community and an express determination of a particular degree of acceptance within that community." . . . . Widespread acceptance can be an important factor in ruling particular evidence admissible, and "a known technique which has been able to attract only minimal support within the community," may properly be viewed with skepticism.

Id. at 593-94.

Based on the above, the Court now engages in a post-trial *Daubert* analysis.

ii) *The Three Tests*

The three tests are: "(1) abbreviated Hydrostatic Design Basis testing, referred to by shorthand as 'HDB' testing; (2) Longitudinal Tensile Strength testing, referred to by shorthand as 'LTS' testing; and (3) 'Quick Burst' Testing, referred to by shorthand as 'QB' testing." *See* Docket No. 2756 at 3 of 11. Organizations such as the ASTM International ("ASTM") (formerly known as the "American Society for Testing and Materials"), the Plastic Pipe Institute, Inc. ("PPI") (a trade association representing all segments of the plastics piping industry), the American Water Works Association ("AWWA") (an international non-profit, scientific and educational association founded to improve water quality and supply), and Underwriters Laboratories, Inc. ("UL") created those standards and testing methodologies and/or monitor those standards/tests. *See* Folkman Test., 10/25/18 Tr. Trans. at 4416-17, Docket No. 2844; Davis Test., 10/12/18 Tr. Trans. at 1346, Docket No. 2848; Paschal Test., 10/18/18 Tr. Trans. at 2429-31, Docket No. 2840.

Hydrostatic Design Basis "HDB"): In general, hydrostatic design basis ("HDB") is the *estimated* long-term strength of a plastic pipe *material* in the circumferential direction of the pipe when subjected to certain tests. Although the material is being evaluated in

the context of its being used to form PVC pipes, the result is not a "pressure" rating of the manufactured pipe but rather the long-term hydrostatic strength of the compound from which the pipe is made. The ASTM D 2837 is the standard test method for obtaining HDB for thermoplastic pipe materials. *See* Folkman Test., 10/25/18 Tr. Trans. at 4425-26; Paschal Test., 10/18/18 Tr. Trans. at 2437-38.

As stated in the relevant version of the ASTM D 2837:

> 1.1 This test method describes a procedure for obtaining a long-term hydrostatic strength category, referred to herein as the hydrostatic design basis (HDB), for thermoplastic pipe materials based on the material's long-term hydrostatic strength (LTHS). The LTHS is determined by analyzing stress versus time-to-rupture (that is, stress-rupture) test data that cover a testing period of not less than 10,000 h[ours] and that are derived from sustained pressure testing of pipe made from the subject material. The data are analyzed by linear regression to yield a best-fit log-stress versus long time-to-fail straight-line equation. Using this equation, the material's mean strength at the 100,000 h[our] intercept (LTHS) is determined by extrapolation. The resultant value of the LTHS determines the HDB strength category to which the material is assigned.

See ASTM D 2837 at § 1.1, Tr. Ex. 20170 at 1 of 14. ASTM D 2837 provides that the procedure to obtain individual data points for the linear regression analysis is set forth in ASTM D 1598.[52] *Id.* at § 1.4. The test method consists of exposing specimen pipes made from the subject material to a constant internal pressure while in a controlled environment.[53] *Id.* at § 1.1. A minimum of 18 failure stress-time points for each environment is required − with at least six for periods less than 1,000 hours, three for periods between 10 to 1,000 hours, three for periods between 1,000 to 6,000 hours, three for periods greater than 6,000 hours, and one for a period greater than 10,000 hours. *Id.* at § 5.2. When the long-term stress regression line of a compound is already known, ASTM D 2837 allows using fewer points and shorter times to confirm material characteristics or to evaluate minor process or formulation changes. *Id.* at § 5.2.1, Note 4, which references the PPI TR-3.

The test results obtained pursuant to the methodology described in ASTM D 2837 and D

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[52] ASTM Designation: D 1598-02, Standard Test Method for Time-to-Failure of Plastic Pipe under Constant Internal Pressure ("ASTM D 1598") at § 7.1, Tr. Ex. 20240.

[53] Specimen pipes are made from the PVC compound material and formed into pipes of a designated size ranging from at least 12 inches to above 30 inches. *See* ASTM D 1598 at § 7.1. Unless otherwise agreed upon, the specimens are tested at a 23°C temperature by filling them with a test fluid (usually water), attaching them to a pressurizing system, immersing the specimens in a conditioning medium (usually water), gradually raising the internal pressure in the specimen to the test level, keeping said test level constant throughout the test period, and recording the time-to-failure of each specimen. *Id.* at §§ 4-5.

1598 are used to calculate the estimated long-term hydrostatic strength ("LTHS") of the pipe material, which is defined as "the estimated tensile strength in the wall of the pipe in the circumferential orientation that *when applied continuously will cause failure of the pipe at 100,000 h*[*ours*]." *Id.* at § 3.1.6 (emphasis added). The way that is accomplished is set forth in ASTM D 2837 at §§ 4-5 and includes, *inter alia*: (1) calculating (from the linear regression of the data points[54]) the LTHS at 100,000 hours, the LTHS at 50 years,[55] and estimating the LTHS using expansion test data. *Id.* at §§ 4.2-5.4. The HDB category is reached by determining the calculated LTHS value and then referencing Table 1 in the ASTM D 2837 to select the appropriate category. *Id.* at §§ 3.1.6, 4-5. For example, if the range of LTHS is 3,830 to 4800 psi, then the HDB category would be 4,000 psi. *Id.* at Table 1.

The HDB category/figure is not one that is ultimately dispositive of the long-time strength of PVC pipe issue in regards to failure in actual use; rather it is the basis for further calculation of the hydrostatic design stress ("HDS"). As defined in ASTM D 2837, HDS is "the estimated maximum tensile strength in the wall of the pipe in the circumferential orientation due to internal hydrostatic pressure that can be applied continuously with a high degree of certainty that failure of the pipe will not occur." *Id.* at § 3.1.8. One obtains the HDS by multiplying the HDB by one of two types of design factors[56] ("DF," *Id.* at § 4.4) − the first group relates to manufacturing and testing variables, and the second group relates to use variables such as installation issues, environment, temperature, etc.) − where the design factor is selected "so that the hydrostatic design stress obtained provides a service life for an indefinite period beyond the actual test period." *Id.* at § 5.5. Thus, HDS = HDB x DF. Further, as stated in the AWWA Manual M23 (2nd ed.), PVC Pipe – Design and Installation ("AWWA M23") at 2, Tr. Ex. 33024, admitted October 18, 2018, Docket No. 2804-2 at 15 of 35, "PVC pipe extrusion compounds must provide acceptable design stress properties as determined by long-term strength testing under hydrostatic pressure.

[54] As stated in § 1.2 of ASTM D 2837, "[u]nless the experimentally obtained data approximate a straight line, when calculated using log-log coordinates, it is not possible to assign an HDB to the material." "A fundamental premise of this test method is that when the experimental data define a straight-line relationship in accordance with this test methods requirements, this straight line may be assumed to continue beyond the experimental period, through at least 100,000 h[ours]." *Id.* at § 1.3.

[55] The term "long-term hydrostatic strength at 50 years," as used in ASTM D 2837, is a mathematical extrapolation and does not represent any actual service life. *See* PPI TR-3 at iii.

[56] ASTM D 2837 at § 3.1.7 defined "service (design) factor" as "a number less than 1.00 (which takes into consideration all the variables and degree of safety involved in a thermoplastic pressure piping installation) which is multiplied by the HDB to give the HDS."

Hydrostatic design stress ratings for pipe compounds are established after 10,000 hr of hydrostatic testing."[57]

In the present case and during the relevant period, the AWWA C905 standard specified that for PVC pipe used in water projects that the design factor was 0.5, whereas the AWWA C900's design factor was 0.4.[58] *See* Testimony of Steven Richard Ferry ("Ferry Test."), 11/2/18 Tr. Trans. at 5875-76, Docket No. 2864; Folkman Test., 10/25/18 Tr. Trans. at 4420-21; AWWA M23 at 34. As a practical matter, an HDB category of 4,000 psi would mean that the PVC pipe with that certification could theoretically fail after about 11.4 years of 4,000 psi tensile stress continuously applied. *See* ASTM D 2837 at § 3.1.5; Ferry Test., 11/2/18 Tr. Trans. at 5907; Folkman Test., Tr. Trans. at 4421. Adopting the design factor of 0.5 for the HDB category of 4,000 psi results in the HDS figure of 2,000 psi, which is the estimated maximum tensile stress in the wall of the pipe in the circumferential orientation due to internal hydrostatic pressure that can continuously be applied on the pipe with a high degree of certainty that failure will not occur. Thus, the HDS supplies what is sometimes referred to as a "safety factor" ("SF") that provides a "wide interval of confidence" against unforeseen circumstances.[59] *See* Ferry Test., 11/2/18 Tr. Trans. at 5905-08; Folkman Test., 10/25/18 Tr. Trans. at 4421-23. Consequently, while the HDB category references 4,000 psi and its concomitant minimum LTHS is 3,830 psi, when a design factor of 0.5 is applied, it means that the PVC pipe at issue will not be expected to be subjected to more than 2,000 psi in

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[57] As explained by Folkman:

> HDB is a hydraulic measurement of what kind of long-term strength that pipe has. Plastics are different than what most people are used to. You can put a load on them, a certain load, and . . . . [i]f it is a short-term load, they have quite a bit more strength, but over time, the strength decreases.
>
> And one of the major concerns of not just PVC but all plastic pipe is establishing a hydraulic basis, a basis of strength that we can say over a long period of time subjected to steady loading, steady pressure, how – will this pipe fail over a certain periods of time.
>
> If we stay below a certain stress level, we know it won't fail over a certain period of time. And that is the basis of HDB.
>
> It makes pipe analysis a lot more complicated than you would for steel or typical materials, because the time transpired that a load is applied affects what its strength is.

See Folkman Test., 10/25/18 Tr. Trans. at 4418, Docket No. 2844.

[58] Sometime after this lawsuit was filed, the design and safety factors for C900 and C905 PVC pipe were "unified" and now for both C900 and C905 pipes the design factor is 0.5 and the safety factor is 2. *See* Folkman Test., 10/25/18 Tr. Trans. at 4420-21.

[59] It is sometimes stated that the design factor is the inverse of the safety factor and vice versa, *i.e.* DF = 1/SF or SF = 1/DF; *e.g.* a design factor of 0.5 will have a safety factor of 2. *See* Ferry Test., 11/2/18 Tr. Trans. at 5907.

its given application. *Id.* Therefore, a failure of the PVC pipe material to reach a LTHS of 3,830 psi or more does not mean that the manufactured pipe will have an actual and measurable reduction in its longevity as compared to pipe material that meets the HDB category of 4,000 psi.

Longitudinal Tensile Strength ("LTS"): As its name indicates, longitudinal tensile strength ("LTS") test measures the tensile strength or useful limit of the pipe material by determining the point at which it will break or severely distort. The test is conducted (not on the pipe itself but) by pulling on the ends of a specifically made specimen of the pipe material with a known cross-sectional area (in square inches) at a constant rate and measuring the force (in pounds) until failure.[60] *See* Paschal Test., 10/17/18 Tr. Trans. at 2224-25. The LTS is delineated in Underwriters Laboratories, Inc.'s Standard for Safety for Pipe and Couplings, Polyvinyl (PVC), for Underground Fire Service ("UL 1285"), Tr. Ex. 1302, admitted October 17, 2018, Docket No. 2804 at 17 of 35. UL 1285 at § 17 requires that "[m]achined specimens from the pipe shall have a minimum tensile strength of 7000 psi . . . . Sample of each pressure class . . . are to be tested for tensile strength in accordance with the Standard Test Method for Tensile Properties of Plastic, ANSI/ASTM D 638-1999 or Standard Test Method for Tensile Properties of Plastics, (Metric), ANSI/ASTM D 638M-1996." The LTS does not provide data as to long-term hydrostatic strength but is only an indication of short-term strength of the material. *See* Paschal Test., 10/17/18 Tr. Trans. at 2225-26. AWWA C900 and C905 standards do not require LTS testing.

Quick Burst Test: The quick burst test is another means of measuring the short-term strength of the compound material used to make PVC pipe. It establishes the "short-time hydraulic failure pressure of thermoplastic . . . pipe." *See* ASTM Designation: D 1599-99, Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe ("ASTM D 1599") at § 4.1, Tr. Ex. 6708 at 1 of 3, admitted October 12, 2018, Docket No. 2804-2 at 21 of 35. The method calls for six inch (or less) specimen pipes to be placed in a constant temperature water bath for a minimum period of time and thereafter loaded onto an apparatus whereby the pipe is subjected to a short-time interval (normally up to 60 to 70 seconds) of increasing internal hydraulic pressure until the specimen failure (normally any instantaneous or rapid loss of

[60] The behavior of plastics like PVC in the LTS test will vary greatly depending on the specific conditions under which the test is conducted – *e.g.*, the proportions of the sample used, the rate at which the sample is stretched (at a very high rate, PVC is like brittle glass; at a low rate, it stretches like rubber), the temperature under which the test is administered, etc. Therefore, the reported LTS figure of a specified pipe material cannot properly be compared with a different sample unless the testing conditions are sufficiently the same.

pressure).[61] *Id.* at §§ 7-9. As specifically stated in the ASTM D 1599, quick burst test results "are generally not indicative of the long-term strength of thermoplastic . . . pipe."[62] *Id.* at § 4.1.

It is unclear from the evidence presented at the Phase Two Trial and from the arguments of counsel whether, during the 1996-2006 period, there was a requirement for quick burst tests to be performed on AWWA C905 pipe at all.[63] While AWWA C900 § 4.3.3.2 calls for a test of the "quick burst strength of pipe" to be conducted in accordance with the "procedural requirements listed in ASTM D 1599," there is no comparable section in AWWA C905 or other germane reference to quick burst tests as to C905 pipe. *See generally* Tr. Ex. AWWA-007.

iii) *The Three Test Standards' Themselves Are Devoid of Any Expressed Relationship to PVC Pipe Longevity*

Plaintiffs' counsel conceded that "We told the jury – we argued to the jury the standards don't address longevity." *See* Tr. Trans. at 8419, Docket No. 2871. The question therefore arises as to how Plaintiffs' experts managed to offer opinions as to a measurable reduction in the longevity of PVC pipe arising from the failures to meet the three tests litigated in the Phase One trial when those standards don't address longevity, and one expressly disclaims any correlation to actual pipe life. This is especially so where the tests were created to calibrate short-term or long-term *strength* of the pipe *material* (not as to the longevity of pipe made from the material) and where, as to long-term strength, the HDB/HDS standard was promulgated with a "design/safety

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[61] If the specimen fails in less than 60 seconds, the rate of pressurization is reduced and the test is repeated. *See* ASTM D 1599 at § 9.1.3. Unless otherwise specified, the "time to failure for all specimens shall be between 60 and 70 [seconds]." *Id.*

The time period allotted for the quick burst is extremely important even though it is measured in seconds. Many thermoplastics give significantly different burst strengths depending on the time-to-failure period that is utilized. *See* ASTM D 1599 at Note 1 ("For instance, significant differences have been observed between failure times at 65 [seconds] and 85 [seconds].").

[62] J-M called as an expert witness Steven Richard Ferry who stated that he has been a member of the ASTM for over 15 years and a member of the AWWA for over ten years. *See* Ferry Test, 11/2/18 Tr. Trans. at 5875-76. He further indicated that he is the Vice-Chair of the ASTM F17.40 subcommittee which is the test method subcommittee as to each and every one of the ASTM tests including ASTM D 2837, D 1598 and D 1599. He provided unrebutted testimony that, initially, quick burst test results were used to design pipe qualifications but that quickly proved problematic. *Id.* at 5886-87. Thereafter in the 1960s, ASTM D 2837 was developed to provide a more reliable foundation to determining the long-term strength of thermoplastic pipe. *Id.*

[63] For example, William Fassler (a "R&D supervisor" at J-M) testified that in 2002 he prepared a recommendation that J-M raise its internal quick burst requirement to 7,200 psi as to AWWA C905 pipe, which was *not* adopted. *See* Testimony of William Fassler ("Fassler Test."), 10/24/18 Tr. Trans. at 4100-01, 4110-11, Docket No. 2718. *But see* statement of defense counsel (*i.e.* David M. Bernick): "I frankly don't know exactly why it wasn't adopted for C905, but I suspect it was also because I don't believe that, with respect to C905, there actually is a Quick Burst requirement." 10/24/18 Tr. Trans. at 4005.

factor."

As noted *supra*, the three standards involved in this case, their concomitant tests, and the organizations which created them, do not indicate any specific lifetime or life expectancy as to compliant pipe. Nor do they delineate any specific effect on (or reduction of) pipe longevity caused when the pipe material fails to meet the standards.[64]

While none of the three tests provides a basis for actually calculating the lifespan of PVC pipe, what they do survey is also not directly related to the pipe longevity. All three tests concern the thermoplastic pipe *materials*; they are not tests of the manufactured pipe itself operating in real world conditions.

The HDB is referenced as a determination of the long-term strength of pipe materials. But what the HDB test provides is: (1) a measurement of the materials' LTHS which is "the estimated tensile strength in the wall of the pipe in the circumferential orientation that when applied will cause failure at 100,000 h[ours]" (*see* ASTM D 2837 at § 3.1.5); (2) the HDB itself is "one of a series of established stress values for a compound" which "is obtained by categorizing the LTHS in accordance with Table 1 [in the ASTM D 2837]" (*Id.* at § 3.1.6); and (3) the HDB category or stress value is thereafter used to calculate the HDS which is achieved by multiplying the HDB by a design factor which is less than 1 (*Id.* at § 5.5). The only reference to time, duration or longevity in the HDB standard/test, is that the LTHS figure (on which the HDB category is based) is an *estimation* of "the tensile stress in the wall of the pipe" that when applied continuously "will cause *failure* of the pipe at 100,000 h[ours]" (or at about 11.4 years). Obviously, that is not the end of the analysis as the standard/test does not end with the HDB category. Instead, the HDS is obtained by multiplying the HDB by the design factor such that, based on the linear regression analysis, a lower HDS figure is produced which results in the reasonable expectation that the service life for the pipe will be for an *indefinite* time *beyond* the actual test period of 100,000 hours. *See* ASTM D 2387 at § 5.5. But how long of a period beyond 11.4 years is never determined, stated or predicted.

Given the above elements, when an entity is making a determination as to the qualities

[64] *See e.g.* Edwards Test., 10.19/18 Tr. Trans. at 3111 ("Q. [Do the standards] tell you what to do and how to measure lifetime of non-compliant pipe? A. No."); Paschal Test., 10/18/18 Tr. Trans. at 2436 ("the standard [ASTM D 2837] does not address the issue of percentage noncompliance or that type of thing."); Davis Test., 10/12/18 Tr. Trans. at 1421 ("Q. . . . Does 2837 purport to tell you how long noncompliant pipe will last? A. It does not. Q. Does any standard of which you are aware? A. Not that I am aware.").

which its particular PVC pipe material must possess in regards to long-term hydrostatic strength, it has to consider the design factor as a means of assuring that the pipe material will be sufficient for its intended use.[65] In the present case, the AWWA has done the analyses as to PVC pipe for water projects and (during the relevant period) selected design factors of 0.5 and 0.4 respectively as to C905 and C900 pipes. *See, e.g.,* AWWA C905 at § 4.6. Therefore, the AWWA was satisfied "to a high degree of certainty" that failure of the pipe would not occur with design factors that respectively would have the estimated maximum tensile strength in the walls of the pipe (due to hydrostatic pressure that can be applied continuously) at 2,000 psi for the C905 pipe and 1600 psi for the C900 pipe. As a result, under the HDB/HDS standard in ASTM D 2837, the lifetime or longevity of compliant C905 and C900 PVC pipe made from the tested material is not calculated or determined other than to observe that it will be for "an indefinite period beyond" 11.4 years. Likewise, should the pipe not meet the HDB figure or fall within its corresponding range of calculated LTHS values in Table 1, there is no indication of how much lower or less longevity would result. Additionally, the presence of the safety factor further complicates any attempt to perform any such a calculation.

The LTS and quick burst tests both attempt to measure the short-term strength of the PVC pipe material. Neither of those tests nor their promulgating organizations give any indication or even suggestion that the tests in any way relate to the longevity of PVC pipe made from the materials/compounds that are the subject of the tests. Additionally, neither of those tests has any direct, measurable correlation with long-term hydrostatic strength as covered by the HDB/HDS standard. *See*, *e.g.*, ASTM D 1599 at § 4.1 ("Data obtained by this test method [*i.e.* quick burst] are of use only in predicting the behavior of pipe . . . under conditions of temperature, time, method of loading, and hoop stress similar to those used in the actual test. They are generally not indicative of the long-term strength of thermoplastic . . . pipe . . . ."). As explained in AWWA M23 at 54:

> Traditional nonplastic pressure pipes display an insignificant difference between short-term and long-term design strength. A pressure rating for some nonplastic pipes based on quick-burst testing is satisfactory. However, the hydrostatic pressure capacity of PVC pipe, as defined by its pressure rating or pressure class, is derived through *long-term* hydrostatic pressure testing conducted to establish long-term strength.
>
> *Design for long-term, steady-state operating conditions based upon the short-term strength of PVC pipe would be inappropriate*. For example, Pressure Class

[65] For example, the United States Department of Transportation has designated a design factor of 0.32 as to HDB for thermoplastic pipe used in natural gas applications. *See* 49 C.F.R. § 192.121(a) (2020).

> 150 (PC 150) PVC pipe (AWWA C900) will easily withstand a short-term application of 755 psi (5.21 MPa) hydrostatic pressure. However, application of the same pressure for 1 h[our] could result in pipe burst . . . . The pressure class or pressure rating of the product refers to its anticipated steady-state, continuous operating conditions and thus *must be* derived from its long-term strength.

See Tr. Ex. 33024 at 66 of 181 (emphasis added). Plaintiffs' experts in the Phase Two trial did not proffer any admissible evidence of a mathematical or calculable relationship between quick burst or longitudinal tensile strength tests and HDB.[66] Nor do those experts rebut the statements in AWWA M23 that short-term strength attributes of PVC pipe should not be utilized in designing for pipe with a steady-state, continuous operating condition.

iv) *Testimony of Bruce Allen Davis*

Plaintiffs proffered Bruce Allen Davis as an expert on "polymer science and processing." *See* Davis Test., 10/12/18 Tr. Trans. at 1342, Docket No. 2848. Davis received his bachelor's degree in general engineering and master's degree in mechanical engineering (specifically tribology) from the University of Illinois Champaign-Urbana; and a Ph.D in polymer science (specifically polymer processing/extrusion) in 1995 from the University of Wisconsin. *Id.* at 1342-43. Since 1995 he has worked solely at a company called The Madison Group and engages in material testing and failure analysis of polymer products including PVC pipe. *Id.* at 1342-46. He is a member of ASTM International. *Id.* at 1346. As to the general causes of PVC pipe failure, Davis stated: "PVC pipe can fail because of installation, overstress kind of loads; PVC pipe can fail because of over pressurization; misuse; PVC pipe can also fail because of manufacturing issues; manufacturing deficiencies in the manufacture, the production of the pipe." *Id.* at 1348.

Davis initially testified that the HDB standard was established in ASTM D 2837 which was incorporated into specifications delineated for AWWA C900 and C905 pipe. *See* Davis Test.,

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[66] *See, e.g.,* Davis Test., 10/12/18 Tr. Trans. at 1472 ("Q. As a polymer scientist, is there a mathematical correlation between the change in the Quick Burst test and the level or the number of the amount of the HDB, mathematical correlation? A. I don't know as we sit here right now . . . . without running the math and doing the models, I can't say there is or is not is my answer."); Paschal Test., 10/17/18 Tr. Trans. at 2365-66 (in his 2013 deposition, Paschal testified: "Q And you have never seen any sort of mathematical correlation between the Quick Burst value of pipe and its HDB; correct? A. It is more of a general relationship. There is not a direct mathematical equation that you use. Q. You are not aware of any mathematical correlation between Quick Burst value of pipe and HDB; correct? A. As I said, it is more general than that in terms of running the Quick Burst and using that to determine your HDB as you start the testing, but it is not a direct mathematical formulation."); Paschal Test., 10/17/18 Tr. Trans. at 2358-59 (Q. … But in matter of fact your model, your work has done no analysis to demonstrate an actual quantitative relationship between longitudinal tensile strength and HDB, does it? A. There was no HDB data related to the long-term tensile strength from the original testing. * * * * Q. You have presented no data to the jury today that establishes an actual quantitative relationship between those two things; correct? A. Correct.").

10/12/18 Tr. Trans. at 1410, Docket No. 2837. He also stated that ASTM D 2837 does not purport to indicate how long non-compliant pipe will last; and that he is unaware of any standard that does so. *Id.* at 1421. Nevertheless, Davis proceeded to testify that, for "known" pipe material where the linear regression line has already been established, changes in quick burst results will "bear a relationship to long-term strength and durability." *Id.* at 1429-30. He opined that, where there was a substantial decline in the quick burst test results (*e.g.*, from averaging 7,200 psi down to 6,800 psi), he "would expect to see a corresponding or direct decrease in the long-term strength and durability." *Id.* at 1430-31. Davis went on to emphatically state: "I would say they are directly related. You see a decrease in one, you will see a decrease in the other." *Id.* at 1431. He also gave similar testimony as to decreases in longitudinal tensile strength tests, *i.e.* that there is a relationship between longitudinal tensile strength test results and long-term strength/durability – which is that "if you have a decrease in . . . longitudinal tensile strength, I would expect a corresponding decrease in the long-term properties as well."[67] *Id.* at 1440-42.

On cross-examination, Davis admitted that, while he was "familiar" with the three standards on which he gave testimony, "I would not consider myself an expert in the standards." *Id.* at 1467-68. He conceded that the ASTM D 1599 standard for quick burst testing itself specifically warned that quick burst test data "are generally not indicative of the long-term strength of thermoplastic or reinforced thermoplastic resin pipe." *Id.* at 1469. He also divulged that, outside of this present litigation, he had never been asked to interpret the ASTM D 1599/quick burst test standard. *Id.* Later, when asked: "But as you sit here today as a polymer scientist, . . . you can't tell us if in fact there is a mathematical correlation between a change in Quick Burst and a change in HDB; correct?" to which he answered: "Again, without running the math and doing the models, I can't say there is or is not is my answer." *Id.* at 1472. Davis also confessed that he doesn't recall taking a look at the literature in the industry for the purpose of investigating what studies have been done in regards to the relationship between quick burst data and HDB/long-term hydrostatic strength. *Id.* at 1473. He revealed that he could not recall reading any of the references that were contained in the reports that were prepared by both Plaintiffs' and Defendant's experts. *Id.* at 1477. He concurred that: (1) under the ASTM D 2837 standard, one is not supposed to include

[67] While Davis testified that he "would *expect*" that a lowering of longitudinal tensile strength test results would give rise to corresponding decreases in long-term strength properties, he cited to no studies or scientific proof that confirms his expectations. Likewise, he proffered no way to measure or estimate any purported corresponding diminutions.

data from tests less than a minimum of 10 hours in length (whereas quick burst tests are normally completed in 60 to 70 seconds); and (2) the "accelerated regression" approach, that he cited, is not "called out" in the ASTM D 2837 or AWWA C900/905 standards. *Id.* at 1482-83. Davis testified that he does not recall ever offering an opinion that calculates the longevity of pipe. *Id.* at 1492-93. He also stated that he has never used the methodology employed by Plaintiffs' other experts (*i.e.* Edwards and Paschal) of utilizing HDB to predict future failures or service life of PVC pipe. *Id.* at 1495. Lastly, Davis agreed that it is very difficult to determine how long compliant PVC pipe will last, let alone non-compliant pipe. *Id.* at 1495-96.

The Court would grant Defendant's *Daubert* motion as to Davis' testimony that a reduction in quick burst and/or LTS test results would establish or suggest any *measurable* corresponding reduction in the HDB/HDS and/or in the long-term strength of PVC pipe. Initially, Davis conceded he was not an expert in the standards on which he opined. Next, his testimony runs afoul of all four factors specifically discussed in *Daubert.* First, Davis gave no indication that his theory can be or has been tested. He, himself, has never done any such scientific examination or experimentation to confirm it. Second, his theory has never been subjected to peer review and/or publication. Indeed, it appears that he has never exposed his ruminations before being hired as an expert in this action and never outside of this lawsuit. Third, the short-term strength tests which Davis references (*i.e.* quick burst and LTS) use totally different methodologies from the constant (but ever-lengthening time period) pressure process employed by ASTM D 2837 for its HDB standard. Also, they measure different characteristics of the pipe material. Further, the ASTM D 2837 incorporates a design factor which injects a safety factor such that, as to the HDB category figure, pipe materials which do not reach that figure will not necessarily result in failure in their intended use over extended periods of time.[68] Davis fails to indicate that he considered the design/safety factors and the HDS in formulating his opinions. Fourth, Davis' theory has no acceptance within the industry, in fact just the opposite. As noted *supra*, (1) the standard set out in ASTM D 1599 states that quick burst data is generally not indicative of long term strength of thermoplastic pipe; (2) the ASTM D 2837 standard cautions that one is not to use failure points

[68] As noted *supra*, AWWA C905 designated a safety factor of 2 as to PVC pipe which means that, even though the HDB figure of 4,000 psi may not be met, the pipe could be utilized because the expected stresses due to the internal pressure within the pipe from the water in use would be 2,000 psi or less. *See* Folkman Test., 10/25/18 Tr. Trans. at 4421-23.

for stresses that have failure times less than 10 hours (*see, e.g.,* Ferry Test.,11/2/18 Tr. Trans. at 5889); (3) AWWA M23 indicates that short-term strength characteristics of PVC pipe materials should not be employed in designing for long-term, steady state operating conditions; and (4) initial attempts to utilize quick burst data for long-term design purposes mostly failed which led to the promulgation of ASTM D 2837.

In light of the above analysis, the Court finds Davis' testimony in regards to a relationship between quick burst/LTS test results and long-term strength/HDB figures plus his opinions as to the longevity of PVC pipe fail under *Daubert*.[69] Therefore, they are stricken.

v) *Testimony of Dale B. Edwards*

Plaintiffs' expert Dale B. Edwards graduated from the University of Illinois Urbana-Champaign, took material science courses at Illinois Institute of Technology, and worked for about 18 years at Bodycote Broutman (a plastics consulting laboratory) and, for the past 12 years, at Engineering Systems, Inc. (an engineering firm specializing in material science and accident reconstruction). *See* Edwards Test., 10/19/18 Tr. Trans. at 2819-22, Docket No. 2850. He has published in the field of plastic polymers and, up to 2008, had been an instructor "teaching failure analysis and testing of plastic materials." *Id.* at 2823-24. He is familiar with the industry standards that pertain to PVC pipe. *Id.* at 2822-23. As to the precise nature of his expert testimony for the Phase Two trial, Edwards stated that:

> What I've been asked to focus on in this phase of the litigation was to look at all of the available quick-burst data which is QC data that J-M has done from 1996 to 2006 on all of their production pipe . . . . And the task was to look at these and to see what those quick-burst values could tell us about the long strength [sic] and durability of the PVC pipe sold by J-M during that time.

Id. at 2826.

Edwards began his testimony by stating that "the standards are silent on the subject of noncompliant pipe other than that's the end of the story; if it's noncompliant you can't sell it." *Id.* at 2828. He then stated that, in an effort to measure the life expectancy of non-compliant pipe, "You can utilize some of the testing that was -- that is done for compliant pipe or called for or

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[69] As Davis conceded at the conclusion of his testimony:

> Q. And even with knowing that there might be a reduction in strength, the standards organizations are very careful to say HDB does not equate to actual service life; correct?
>
> A. Correct. Taking an HDB and getting a service life without knowing what the service conditions are; correct.

Davis Test., 10/12/18 Tr. Trans. at 1519-20.

required for compliant pipe, you can still use some of those test methods in analyzing noncompliant pipe, as well as potentially some other testing as well." *Id.* at 2828-29. Edwards admits that prior to having become involved in this litigation, he would have said that quick burst test results and HDB data "both are strength tests and that increase or a decrease in, say, quick burst, would certainly cause me to think there would be an increase or decrease in the long-term properties as well, not a well-defined relationship, no." *Id.* at 2829. He thereafter proceeded into a lengthy exposition as to the use of accelerated regression which purportedly would allow a determination as to whether the PVC compound material was still meeting the HDB standard, but by means of fewer data points and much shorter testing times (*e.g.*, six minutes or less rather than the minimum 10 hours delineated in ASTM D 2837).[70] *Id.* at 2834-44. Edwards opines that his accelerated

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[70] Edwards stated that certain standards such as ASTM D 2241 utilize the accelerated regression test. *See* Edwards Test., 10/19/18 Tr. Trans. at 2842. However, he did not testify that the applicable standards that were litigated in the Phase One Trial (*e.g.* ASTM D 2837 which also explicitly incorporates ASTM D 1598) include any provision for accelerated regression testing. Additionally, Edwards indicated that the "2241 pipe" is not AWWA C900 pipe which (along with AWWA C905 pipe) was the subject of the Phase One Trial. *Id.* at 3101.

ASTM D 2241 does provide for an "accelerated regression test" but it is very specific in delineating the methodology. *See* ASTM Designation: D 2241-05, Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series) ("ASTM D 2241"), Tr. Ex. 5207, admitted October 17, 2018, Docket No. 2804 at 21 of 35. ASTM D 2241 states:

> The accelerated regression test shall be used *in place of both the sustained and burst pressure tests*, at the option of the manufacturer. The test shall be conducted in accordance with 8.4.1. The pipe shall demonstrate a hydrostatic design basis projection at the 100,000-h[our] intercept that meets the hydrostatic basis category requirement (see the table for "Hydrostatic Design Basis Categories" of Test Method D2837) for the PVC pipe material used in its manufacture.

Id. at § 6.2.1 (emphasis added). ASTM 2241 at § 8.4.1 provides that:

> *Accelerated Regression Test* – Test in accordance with procedures in Test Method D 1598, using either free end or restrained end fittings. A minimum of six specimens shall be tested. Test three specimens at a single pressure that result in failures at or below 0.10 h[our]. Test additional three specimens at a single pressure that will result in failures at about 200 h[our]. Generating additional data points to improve the LTHS or LCL, or both, is acceptable. No points shall be excluded unless an obvious defect is detected in the failure area of the test sample, or there was a malfunction of the equipment. Characterize the data using the least squares regression described in Test Method D2837.

The 0.10 hour portion of the ASTM D 2241's accelerated regression procedure is *not* the same as a quick burst test. It employs constant internal pressure as provided in ASTM D 1598 for the entire six minutes rather than the zero to ever-increasing pressure until failure in 60 to 70 seconds that is called for in ASTM D 1599. Further, § 8.5 of ASTM D 2241 provides for a quick burst pressure test and, as noted in § 6.2.1, the accelerated regression test is used in place of both the sustained and burst pressure tests. Thus, the accelerated regression test in ASTM D 2241 does not utilize the quick burst method or its data.

The procedure for conducting sustained pressure tests in ASTM D 2241 is delineated as follows. Six test specimens with certain size specifications are selected at random and maintained for a period of 1,000 hours at the constant internal pressures listed in Table 3 (varying between 2,300 psi to 4,200 psi), where failure of two or more of the six specimens constitutes a failure of the test. *See* ASTM D 2241 at § 8.4.

regression methodology "permits me to draw a conclusion that there is a very strong correlation of quick burst with long-term strength and durability . . . ."[71] *Id.* at 2836. Edwards also testifies that there are "several papers" and "test methods" which confirm his approach; but the only "scholarship" he actually cites to is an article from "the '70s" by Robert Wilgin, and the test methods he references (and concomitant studies for those test methods) were not created for ASTM D 2837 HDB testing/calculations. *Id.* at 2838-42. Edwards states that one can use "Miner's Rule" which is "basically an accumulative damage model" "that can give you the precise relationship between this ramped-up pressure and this steady pressure."[72] *Id.* at 2862-63. Edwards applies the quick burst data first to the stress regression line for the LTHS score of 3,916 psi (which was the figure from an earlier qualification of J-M's compound) and then to the stress regression line for 3,830 (which is the minimum LTHS score for the HDB 4,000 psi category). *Id.* at 2864-71. From the former application, he concluded that "49.87 percent of the quick-burst values would indicate that the LTHS is actually below 3916," while the latter application shows that "43.87 percent . . . of the pipes based on this analysis of quick burst really fall below, would be noncompliant pipe because they would not have the HDB, minimum HDB that they should have." *Id.* at 2870.

In the end, Edwards' "ultimate conclusion" is:

> Q. So what is your . . . ultimate conclusion about what the quick-burst test and the other things you analyzed show about J-M pipe during 1996 to 2006?
>
> A. What all of this data shows to me is that at least from the quick-burst standpoint, the prediction is that almost 44 percent of the pipe produced from 1996 to 2006 is noncompliant, meaning the LTHS value is below 3830 by our estimation.

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[71] Edwards does not provide a basis or explanation for why accelerated regression tests supply any grounds for concluding that there is a "very strong correlation" between quick burst tests and long-term strength of PVC pipe. The accelerated regression he cites to (*i.e.* the one referenced in ASTM D 2241) does not incorporate any quick burst test as part of the regression methodology. *See* footnote 70, *supra.* Moreover, the applicable standards (*e.g.*, ASTM D 2837 and those in AWWA C900/C905) do not incorporate accelerated regression in any manner suggested by Edwards.

[72] Edwards' belief that Miner's Rule can be used to establish "the precise relationship between [quick burst's] ramped-up pressure and [HDB's] steady pressure" is not only unsupported but is in conflict with the AWWA M23 which states:

> the hydrostatic pressure capacity of PVC pipe, as defined by its pressure rating or pressure class, is derived through *long-term* hydrostatic pressure testing conducted to establish long-term strength.
>
> Design for long-term, steady-state operating conditions based upon the short-term strength of PVC pipe would be inappropriate . . . . The pressure class or pressure rating of the product refers to its anticipated steady-state, continuous operating conditions and thus *must be* derived from its long-term strength.

See Tr. Ex. 33024 at 66 of 181 (emphasis added).

> Q. Does that mean it will fail sooner than it otherwise would have were it compliant?
>
> A. Yes, definitely fail sooner than a compliant pipe would.

Id. at 2914. However, he further stated that in order to provide an actual failure date for the non-compliant pipe, one would need other data including the total stresses that the pipe would experience in use plus a "benchmark level of how long compliant pipe would last (which he assumed for this litigation was 100 years because that the general assumption within the industry). *See* Edwards Test., 10/19/18 Tr. Trans. at 3008, Docket No. 2708.

On cross-examination, Edwards admitted that his exact calculation cannot be found in any standard nor has it been "published anywhere." *Id.* at 3021-22. Also, prior to the becoming involved in this lawsuit, Edwards had never performed his series of calculations before. *Id.* at 3022-23.[73] He conceded that, in regards to the tests that the AWWA had required for physical properties, J-M's test results data during the relevant period showed that its pipes had passed the minimum requirements in AWWA C900. *Id.* at 3035-36. As to Edwards' assertion that quick burst data can be used to calculate HDB (*Id.* at 3044), he admits that: (1) the AWWA Manual 23 (*see* Tr. Ex. 33024 at p. 66 of 181) specifically states that "Design for long-term, steady state operating conditions based on short-term strength of PVC pipe would be inappropriate;" (2) that the ASTM standard for quick burst testing (ASTM D 1599 at § 4.3.3.2, *see* Tr. Ex. 6708 at 1 of 3) cautioned that quick burst data is "generally not indicative of long-term strength of thermoplastic . . . pipe;" and (3) he, himself, did not "analyze any relationship between LTHS and HDB." *See* Edwards Test., 10/19/18 Tr. Trans. at 3038-39, 3040, 3046. Likewise, while Edwards asserts that the use of quick burst data can be used for analysis of HDB elements, he concedes that for design purposes his utilization of quick burst results is not accepted by any of the standard organizations, nor has he ever attempted to publish his method or subject it to peer review. *Id.* at 3050-51.

In his attempts to justify his use of test data exponentially lower than the 10-hour minimum delineated in ASTM D 2837, Edwards contended that ASTM D 2837 permitted the use of tests

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[73] As stated in his testimony:

> A. . . . Certainly that combination of everything was a new approach to come up with an answer to the problem that I was asked to analyze. * * * *
>
> Q. And, again, the calculation was a calculation that you had never done before; it wasn't published anywhere; it wasn't in any standard; it was new, right, Mr. Edwards?
>
> A. Yes, I believe so.

See Edwards Test., 10/19/18 Tr. Trans. at 3022-23.

less than 10 hours, if it could be shown that the data was still part of the stress regression line. *Id.* at 3053. However, after questioning by J-M's counsel, Edwards admitted: (1) that the data used by him was not done as part of as ASTM D 2837 test procedure and "wouldn't be on the same theoretical regression line;"[74] and (2) quick burst data cannot be used to determine HDB, but merely "reflects the HDB." *Id.* at 3056-57. Edwards further conceded that, if one could use quick burst results to determine long-term strength, there wouldn't be much purpose for establishing a 10,000-hour test protocol when one could employ 60 to 70 second tests to accomplish the same thing. *Id.* at 3059. Furthermore, the standards organizations require separate testing for quick bursts results and for HDB determination, and make no provision for combining the results. *Id.* at 3059-60.

As for his use of Miner's Rule, Edwards admits that "Miner's Rule has never been adopted for PVC pipe by either ASTM or by AWWA."[75] *Id.* at 3065. As to the cited Wilgin article, Edwards acknowledges that nobody has since 1974 come out and said that quick burst testing could be used to determine long-time strength. *Id.* at 3050-51. He again admitted that his machinations cannot be found in the ASTM methodology and "that [it] was all made for this litigation." *Id.* at 3077. When asked whether: "the idea that you could take a twice-borrowed slope, extend it in both directions, attach it to a Miner's Rule converted Quick Burst result, and come up with a reduced HDB, that is the calculation that no one ever has done before, to your knowledge . . . . That is something you can't find anywhere outside of this courtroom, correct?" Edwards replied: "That's correct."[76] *Id.* at 3078.

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[74] Edwards agreed that the regression line for a ASTM D 2837 test is populated only with sustained pressure results. *See* Edwards Test., 10/19/28 Tr. Trans. at 3055. He acknowledged that the quick burst data he used in his calculations were not sustained pressure results nor were they done as part of any D 2837 test procedure. *Id.* at 3054-57. He also conceded that "it's not part of the test protocol to use a Quick Burst test as part of the regression line." *Id.* at 3058.

[75] As testified by Ferry, "Q. Now, Miner's Rule, . . . is it or is it not in the standard methods for PVC? A. It is not." *See* Ferry Test., 11/2/18 Tr. Trans. at 5893.

[76] Edwards indicated that his opinion that 44% of J-M's pipe would fail earlier that compliant PVC pipe was based on his use of quick burst data to conclude that the LTHS for 44% of the samples was less than 3,830 psi which would show that they would not meet the 4,000 psi category for HDB. *See* Edwards Test., 10/19/18 Tr. Trans. at 3019. However, he later admitted that his calculation/methodology was not found in any standard (and was actually contrary to at least two of the standards/testing organizations' advisals) or in any publication, and, in fact, was created for the first time for purposes of this litigation. *Id.* at 3021-23.

Further, it was pointed out to Edwards that quick burst tests can be done by two procedures "A" or "B." *See* ASTM 1599 at § 9. In the former, the specimens are subjected to uniformly and continuously increasing pressure until failure after between 60 to 70 seconds, and the ending pressure and time are recorded. If the specimen bursts prior to 60 seconds, the test is restarted at a reduced rate of loading. In Procedure B, the test is run by uniformly and continuously increasing the pressure but only up to the minimum burst requirement and held there for

The following exchanges were given by Edwards towards the end of his cross-examination.

> Q. Okay. Now, in point of fact, is it true that according to PPI TR-3, that is according to the PPI technical guidance that is used to certify an HDB of 4,000 PSI, according to them, long-term HDB values are not an actual prediction of actual longevity, correct?
>
> A. Yes, that's in the TR-3.
>
> Q. And isn't it true that your calculations – calculations of reduced LTHS of J-M pipe are not a prediction of actual longevity, isn't that true?
>
> A. They are not a prediction of specific longevity in terms of years of a particular pipe, no.

Id. at 3087.

> Q. Isn't it a fact in your deposition . . . you simply said "yes," that you agreed that your calculations of reduced LTHS are not a prediction of actual longevity? Isn't that what you said?
>
> A. That's what I said.

Id. at 3091.

> Q. I don't see anything in your report that makes any predictions with respect to the pipe these – these plaintiffs have. Am I right about that?
>
> A. Yes, there are no specific predictions.
>
> Q. . . . . Mr. Paschal told us that you would need an awful lot more information to predict rates of failure for actual pipe in use. Do you disagree with that?
>
> A. No, I agree with that.
>
> Q. That's true of your work, too, correct?
>
> A. Yes.
>
> Q. Do you know why it is that you weren't asked to do that work in this case?
>
> A. No.

Id. at 3092.

> Q. Did you ever -- did they ever ask you for a prediction of the lifetime of their pipe?

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60 to 70 seconds; actual pipe failure is not required. *Id.* In the latter situation, it is possible that the non-bursting sample/specimen could have in fact exceeded the minimum burst requirement. Here, Edwards' position was that pipe with quick burst results below 7068 psi was "questionable pipe" which would mean that the pipe would not meet the LTHS of over 3,830 necessary to fall within the HDB 4,000 psi category. *See* Edwards Test., 10/19/18 Tr. Trans. at 3007-08. However, some of quick burst results he used for his calculation were obtained under Procedure B where the minimum burst requirement employed was the AWWA-approved 6,400 psi. Edwards stated that he made no attempt to determine if any of the quick burst data that he considered was done with Procedure B rather than Procedure A, which would have affected his results. *Id.* at 3100-01. Edwards also admitted that some of the data was not from C900 pipe testing requirements but rather from methodologies relevant to ASTM D 2241 pipe, but again he did not investigate the number of those irrelevant tests. *Id.* at 3101-02. ASTM D 2241 requires that pipe that is processed under its standard/methodology must be marked with the "D2241" designation. *See* ASTM D 2241 at § 10.1.5.

> A. I don't believe so.
>
> Q. Did you ever pick up the telephone and call the plaintiffs and say, "Would you like a prediction for the lifetime of your pipe? Or I can help you make that prediction?"
>
> A. No.

Id. at 3093.

The Court would grant the *Daubert* motion and strike Edwards' testimony that the quick burst data on J-M pipe taken from 1996 to 2006 can provide any verifiable/calculable information about the long-term strength or the HDB of J-M PVC pipe sold during that time. The reasons for this ruling are similar to those which justified striking Davis' testimony. Edwards' opinions fail the factors articulated in *Daubert.*

First, Edwards concludes that the quick burst data (which measures the short-term strength of PVC pipe material) from J-M's tests between 1996 and 2006 enables him to predict that "almost" 44% of J-M's pipe produced during that period is non-compliant pipe in that it has a LTHS value of below the 3,830 psi figure required in the relevant HDB category (which gauges the long-term strength of the material). *See* Edwards Test., 10/19/18 Tr. Trans. at 2914. In essence, Edwards has generated a scientific hypothesis that there is a calculable correlation between quick burst data and LTHS which is part of the HDB standard. That hypothesis can be tested to verify its correctness/validity since both are sets of measurements. However, Edwards has conducted absolutely no tests to confirm any actual and/or measurable correlation. While he does perform certain machinations on data (*e.g.,* Miner's Rule), those efforts assume rather than establish the relationship between quick burst and LTHS/HDB.[77] Second, Edwards' theory/technique has not been subject to any peer review and has never been published. Indeed, prior to this lawsuit, Edwards had never publicly espoused the opinion and calculations, which he also admits were all made for this litigation. Third, both the ASTM and AWWA have indicated that the very foundation of Edwards' methodology (*i.e.* that the long-term strength of a thermoplastic pipe compound can be determined from short-term strength tests) is generally inappropriate. Edwards provides no explanation as to why any rational person should adopt his approach as to the meaning

[77] Edwards also referenced a methodology (*i.e.* accelerated regression from ASTM D 2241) which he never established as being required by the standards applicable in this action (*e.g.,* ASTM D 2837, AWWA C900/C905, etc.). Likewise, it is unclear whether any of the test data which he reviewed ever employed accelerated regression, or whether he used it in his analysis. *See, e.g.,* Edwards Test., 10/19/18 Tr. Trans. at 3040 ("Q. Okay. I now want to go to this test data, the test data that you actually gathered. And for your purposes – your analysis, Mr. Edwards, is [sic] doesn't use accelerated regression, correct? A. That's correct.").

and proper use of testing results when his approach is contrary to the pronouncements of the organizations which created the standards and those tests. Finally, the issue (as to which Edwards' testimony was to ultimately address) is the difference in value between pipe that is compliant with the three standards/tests litigated in the Phase One trial and non-compliant pipe. Edwards' opinion as to the supposed relationship between quick burst tests and LTHS/HDB does not (and, indeed, never does) establish the correlation between either of them and longevity (*e.g.*, he admits that his "calculations of reduced LTHS are not a prediction of actual longevity."). He also fails to provide any way to quantify or measure any such relationship.

vi) *Testimony of James R. Paschal*

a) Introduction

James R. Paschal graduated with a degree in aerospace engineering from Iowa State University and received a master's in plastics engineering from the University of Michigan. *See* Paschal Test., 10/17/18 Tr. Trans. at 2112, Docket No. 2699. He joined the ASTM in 1988 and was on various committees within that organization, including the "d20" which wrote standards for PVC resins, and he was chairman of the "PVC piping committee." *Id.* at 2110. He was also on various "standard technical panels" relating to plastic pipe at the UL. *Id.* at 2112. He has published "scholarly articles" on PVC pipe. *Id.* at 2112. For 14.5 years, he was employed at the National Sanitation Foundation where he eventually oversaw all laboratory testing for plastic piping. *Id.* at 2102-03. Thereafter, he worked at Bodycote Broutman and, since 2007, he has had his own engineering and forensic consulting firm. *Id.* at 2104-07.

As to the three tests and concomitant standards that are the subject of this litigation, Paschal's primary focus was on HDB and his theory that a diminution in HDB results in a lessening of the longevity of PVC pipe. *See, e.g.,* Paschal Test., Tr. Trans. at 2360, Docket No. 2839 ("Q. Well, the HDB analysis is what drives the whole machine; right? That is, you are calculating a reduction in HDB which you then take to a reduction in longevity; true or not? A. Yes."). He also testified regarding the short-term strength tests. Paschal examined all of the available tests results from J-M's plants from the period covering 1996-2006, along with some earlier data (*e.g.*, from 1987, when certain of J-M's compounds were qualified under the 10,000-hour test). *Id.* at 2135, 2231, 2252, 2306. According to Paschal, "[a]ny sort of significant change in the short-term properties, short-term mechanical and strength properties is typically going to also result in a change in the long-term strength." *Id.* at 2299-300.

b) Longitudinal Tensile Strength test ("LTS")

As to the LTS, Paschal stated that: (1) the LTS results do not give any LTHS readings (*Id.* at 2223-25); (2) what the LTS actually examines is "the material strength after you have processed that material into pipe . . . . that you haven't damaged the material somehow in that processing, that extrusion process" (*Id.* at 2226); and (3) the LTS standard in the UL 1285 calls for a minimum score of 7,000 psi. *Id.* at 2269; *see also* UL 1285 at § 17. There were J-M LTS test results from 1974 which, at that time, were typically around 7800 (Paschal Test., 10/17/18 Tr. Trans. at 2268-69) but, for the period of 1996-2006, they had fallen to 6800 on average. *Id.* at 2290-91. From that "very significant drop," Paschal opined that:

> It definitely indicates there is something else going on with the material. And I would expect a comparable drop in the HDB values as well for the material. * * * * Typically, any sort of change like that, if you haven't made other changes to the material. If the material is in theory the same, then that type of dropoff can really only be caused by one or two things. Either improper fusion − this fusion that I talked about earlier that happens in the processing of the material and not being fully processed and fully fused together, or actual loss of molecular weight of the backbone of − the polymer backbone of that PVC molecule.

Id. at 2291.

However, on cross-examination, Paschal admitted that:

> Q. But in matter of fact your model, your work has done no analysis to demonstrate an actual quantitative relationship between longitudinal tensile strength and HDB, does it?
> A. There was no HDB data related to the long-term tensile strength from the original testing.
> * * * *
> Q. You have presented no data to the jury today that establishes an actual quantitative relationship between those two things; correct?
> A. Correct.
> * * * *
> Q. And you don't have this data. This data is used nowhere in your calculations; correct?
> A. In which calculations?
> Q. In your calculations of reduced strength. You calculate reduced strength, and in doing so you do not use longitudinal tensile strength; correct?
> A. For the HDB analysis, no, I did not.
> * * * *
> Q. And the longitudinal tensile strength that you focused on with the jury, that is not part of that calculation, is it?
> A. It is supporting information. It is not directly used in the calculation.

Id. at 2358-60.

c) Quick Burst Tests

In regards to quick burst testing, Paschal testified that the minimum figure of 6,400 psi was in the standards but, prior to the 1996-2006 period, certain persons at J-M had felt that they needed to achieve a quick burst value of 7,200 psi in order to maintain the quality of their products and/or to continue to meet the HDB category of 4,000 psi (which requires a 3,830 psi minimum).[78] *Id.* at 2132-33, 2222-23). He stated that J-M's testing data showed that, during the 1996-2006 period, there were "difficult problems" with J-M's achieving the 7200 psi standard that it had set for itself.[79] *Id.* at 2297-98. From that failure to consistently meet the 7200 figure, Paschal concludes that the quick burst results indicate "the same degradation or falloff of long-term HDB." *Id.* at 2300.

However, Paschal admitted that he himself "did not do an analysis of the Quick Burst results . . . in [his] particular analysis . . . ." *Id.* at 2221. He also eventually conceded that he has not actually seen (nor was he ever provided with) any data that in fact establishes a correlation between 7200 psi quick burst results and HDB. *Id.* at 2363. Further, during the Phase Two trial, this portion of Paschal's 2013 testimony from the Phase One trial was read to the jury:

> Q. You yourself said that if you got a particular Quick Burst value on a particular piece of pipe that would not tell you anything about the HDB of that piece of pipe; right?
>
> A. In the absence of any other information.
>
> * * * *
>
> Q. And you have never seen any sort of mathematical correlation between the Quick Burst value of pipe and its HDB; correct?
>
> A. It is more of a general relationship. There is not a direct mathematical equation that you use.

---

[78] As to the dates when J-M had an internal standard of trying to achieve a 7,200 psi for quick burst testing, at one point in his testimony Paschal indicates that it is his understanding that "[f]rom 2000 until 2004, at J-M they raised the Quick Burst test from 6400 psi . . . to 7200." Paschal Test., 10/17/18 Tr. Trans. at 2360-61. However, according to Kai Chan Yang, who was the head of "R&D" at J-M in 2002 (*see* Testimony of Kai Chan Yang, 10/22/18 Tr. Trans. at 3286, Docket No. 2841), J-M reduced the quick burst minimum strength test from 7,200 psi to 6,400 psi. in 2004. *See* Testimony of Kai Chan Yang ("Yang Test."), 10/22/18 Tr. Trans. at 3418, Docket No. 2851).

[79] While Paschal does discuss certain of J-M's employees' belief that a quick burst score of 7,200 psi or more was necessary to achieve or maintain the HDB of the pipe (*see* Paschal Test., 10/17/18 Tr. Trans. at 2308), neither Paschal nor anyone else at the Phase Two trial offered scientific or other foundational evidence that established there was an actual and provable basis for that belief. Paschal said that he believed that, at some point, J-M had established a correlation between quick burst results and HDB because he saw references in certain J-M documents to such an "understanding;" however, he himself never saw any documents establishing the existence of that connection. *Id.* at 2361-63.

> Q. You are not aware of any mathematical correlation between Quick Burst value of pipe and HDB; correct?
>
> A. As I said, it is more general than that in terms of running the Quick Burst and using that to determine your HDB as you start the testing, but it is not a direct mathematical formulation.

Id. at 2365-66.

Additionally, Paschal recognized that section 4.1 of the ASTM D 1599 standard and methodology for conducting quick burst tests (which is incorporated into AWWA C900 standard at § 4.3.3.2) specifically cautioned that quick burst data is "generally not indicative of long-term strength of thermoplastic . . . pipe." While he attempted to explain away his analysis's use of quick burst data to indicate the long-term strength of PVC in contravention of the language in ASTM D 1599, Paschal did not cite to any scientific study, learned treatise, industry acceptance or other reliable bases that adopted his approach. *See, e.g.,* Paschal Test., 10/17/18 Tr. Trans. at 2300-03. Equally problematic is Paschal's actual methodology in his analysis. He initially notes that a quick burst test result of 6,400 psi qualifies as passing for AWWA C900 pipe as recognized by the standards and testing organizations. While he refers to the approximately 146,000 quick burst tests performed between 1996 and 2006, he treats the vast majority of them as failing even though he has no idea how many of them actually met the AWWA quick burst standard of 6,400 psi.[80] *Id.* at 2460-61, 2628-29. This is because he assumes that J-M's internal temporary practice of trying to achieve a figure of 7200 psi for quick burst tests is somehow controlling. Paschal never adequately explains how J-M's internal policy can trump AWWA's actual standard. As noted above, he certainly had no scientific evidence to support his approach, which again is contrary to the language in the standard itself.[81] Furthermore, if one assumes that the standards and testing

[80] Edwards stated that about 99% of the approximately 146,000 quick burst tests met the AWWA 6,400 psi standard. *See* Edwards Test., 10/19/18 Tr. Trans. at 3028.

[81] Quick burst test results are a measure of the short-term strength of the PVC material. The method for that test is to start the pipe with no pressure and increase the pressure in the pipe uniformly and continuously until failure is achieved, usually within 60 to 70 seconds, as per the instructions in ASTM D 1599. The long-term strength tests do not use an increasing application of pressure but rather expose the pipe specimens to a "constant internal pressure" for lengthy *and* lengthening periods of time as per ASTM D 1598. Thus, quick burst tests and long-term strength tests differ in both the testing method and the type of data that the method produces. While Edwards and Paschal believe that because ASTM D 2241, which is a long-term strength test, does provide for an accelerated regression procedure which utilizes three single tests at or below 0.10 hour, quick burst results can similarly be used to establish HDB levels. But accelerated regression tests are entirely different from quick burst tests and the former still utilizes ASTM D 1598 constant internal pressure mode while the latter do not. In fact, ASTM D 1598 provides cautionary language particularly germane to this area stating: "Some materials may exhibit a nonlinear relationship between log-stress and log-failure time, *usually at short failure times.* In such cases, the 10^5-hour stress value computed on the basis of short-term test data may be significantly different than the value

organizations held some belief or suspicion that quick burst tests could be used to establish or verify HDB requirements, questions arise as to: (1) why those organizations didn't provide for some indication in the respective standards which recognizes the connection instead of including language to the opposite effect; and (2) why would they establish a minimal passing requirement for quick burst tests which would not be sufficient to assure that the quick burst figures would be adequate for HDB verification purposes. Paschal does not venture to answer those questions.

d) HDB

Paschal initially refers to three methods for determining HDB. *Id.* at 2133-34. The first is delineated in ASTM D 2837 (sometimes referred to as "E10," *see Id.* at 2133) which calls for at least 18 data points from tests performed in accordance with ASTM D 1598, where the specimens are under sustained/constant pressure for at least 10 hours and up to at least 10,000 hours. *Id.* at 2125-28. The second is set forth in the PPI TR-3 which is for an "experimental grade" pipe where the normal ASTM D 2837 process is conducted but after 2,000 hours of testing, if the pipe is passing the requirements, the manufacturer can get approval to market the pipe while the testing thereafter continues to its normal 10,000-hour completion.[82] *Id.* at 2133-34. This procedure is sometimes referred to as "E2" testing. *Id.* As to the third method, after pipe materials have received their initial HDB qualification following the full E10 procedure, Paschal references "an on-going test" calling for "accelerated regression" which is set out in ASTM D 2241. *Id.* at 2134, 2213. The accelerated regression test in ASTM D 2241 requires a minimum of six tests − with

obtained when a distribution of data points in accordance with Test Method D 2837 is evaluated." *See* ASTM D 1598 at n.3 (emphasis added).

[82] PPI TR-3 defines "experimental grade" as "[a] PPI HSB recommended rating that is valid for a limited duration, given to those materials covered by data that do not yet comply with the full requirements of the Standard Grade, but satisfy the applicable minimum preliminary data requirements which are detailed in." *See* PPI TR-3 at vi, Tr. Ex. UL-021.

Paschal's testimony as to the E2 testing was inconsistent. On the one hand, he at first stated that the E2 tests results after 2,000 hours could be used for experimental grade pipe so it could be initially marketed as such, but that the testing would go on to complete the full, regular 10,000-hour process. *See* Paschal Test., 10/17/18 Tr. Trans. at 2134 ("Now, you need to − it is required that you continue on to go the full 10,000 hours, but after you successfully complete the E2 level, you can start selling into the marketplace."). Later, he gave the following answer: " Q. If you want to be able to sell the pipe and not have to say it is experimental, but it has been certified as having an HDB of 4,000 psi, isn't it true that you must ultimately do the 10,000-hour test? A. Well, actually, once you get to the 2000-hour, you don't have to say it is experimental. That is what it is referred to as in the document, but there is no requirement that the manufacturers state that." *Id.* at 2442. But, thereafter he admitted that in his deposition he stated "you must eventually have [an E10 test result] as one part of it." *Id.* at 2444. Furthermore, while Paschal implied that pipe could be sold without saying it was experimental, PPI TR-3 stated that the experimental grade rating was only for "a limited duration." *See* PPI TR-3 at vi, Tr. Ex. UL-021.

three from a very short period of constant internal pressure (*i.e.* "three specimens at a single pressure that result in failures at or below 0.10 h[our]") and three from the 200-hour range (*i.e.* "three specimens at a single pressure that will result in failures at about 200 h[ours]"). *See* ASTM D 2241 at § 8.4.1. On the other hand, Paschal does not significantly consider another long-term strength test that is required by the AWWA (*i.e.*, the 1,000-hour sustained pressure test referenced in AWWA C900 at § 4.3.3.1). As stated in that section: "Sustained pressure. The pipe or fabricated fitting shall not fail, balloon, burst, or weep, as defined in ASTM D1598, at the applicable sustained pressure listed in Table 2 when: six specimens are tested for 1,000 h[ours] as specified in ASTM D 2241."

Paschal conducted comparisons between: (1) the three E10 data sets from 1987 tests as to the J-M pipe material which he indicated had an LTHS of 3,916 psi (*see* Paschal Test., 10/17/18 Tr. Trans. at 2263) and (2) his calculation of the LTHS as to 44 data sets[83] from "abbreviated HDB tests" on J-M pipe that were located in J-M's records from the period between 1996 to 2006 (*Id.* at 2231). As to the 44 data sets, they consisted of results from E2 and accelerated regression tests.[84] However, Paschal admitted that "there is no specific requirement in AWWA standard . . . . that it's required to do accelerated regression testing . . . ." *Id.* at 2632. Further, as stated by Paschal, E2 results are not final test results for HDB but rather testing is supposed to continue onward to the 10,000-hour criterion.[85] *Id.* at 2134 (following "experimental grade approval after 2,000 hours of testing . . . . , you need to − it is required that you continue on to go the full 10,000 hours."). Also, it was also pointed out that the J-M records also contained evidence of approximately 1,700

[83] There were actually 50 data sets available but Paschal did not use six of them because they were, in his view, "unsuitable" or a "continuation of another set of tests." *See* Paschal Test., 10/17/18 Tr. Trans. at 2231-32. However, Paschal also stated that certain of the results were not used because he needed to draw a straight line and the data from the unused tests were "scattered around too much to really even look like a line, and so we didn't use that data." *Id.* at 2232.

[84] Paschal stated that he found 10 or "maybe less" accelerated regression tests in J-M's records. *Id.* at 2219. He surmised that, because J-M was initially failing the accelerated regression tests, it demanded that "the thousand-hour test and Quick Burst" be run instead. *Id.* at 2220. As noted *supra,* the accelerated regression standard in ASTM D 2241 at § 6.2.1 specifically gives the manufacturer the option of selecting to use the accelerated regression test. However, when the accelerated regression test is chosen, it is used in place of *both* the sustained pressure test under ASTM D 1598 and the quick burst test. *See* n. 69, *supra.*

[85] Paschal indicated that, according to available records, J-M did not run any E10 (*i.e.* 10,000 hour) test between 1996 and 2006. *Id.* at 2135. Given the fact that the vast majority of the 44 data sets he employed in his analysis were from E2 testing, *see* footnote 81, *supra*, which he has previously indicated were not final results (*see* footnote 79, *supra*), a question arises as to why none of the E2 tests were ever taken to completion.

"sustained pressure" tests during the 1996-2006 period, where J-M appeared to have a successful passing rate of 99.3%. *Id.* at 2629, 2703. As acknowledged by Paschal, the AWWA standard requires sustained pressure testing. *Id.* at 2444-45, 2632. It is unclear why Paschal chose to utilize in his analysis accelerated regression results (which are not required by the AWWA standards) plus E2 test results (which were not final calculations of the HDB) and ignore the 1,700 sustained pressure tests which, according to Paschal, the AWWA does demand. Other than commenting that the sustained pressure test was "an extremely easy test to pass" (*Id.* at 2241-42, 2703[86]), Paschal does not state why those long-term strength tests should not have been considered in his methodology.

For his analysis, Paschal initially assumed that the LTHS of 3,916 psi equated to 100 years of useful life. *Id.* at 2263. In his first run through, he calculated the LTHS of each individual data set and compared the result to 3,916 psi and found that 20 of them were below the 3,916 psi original figure; and, using a straight ratio (*i.e.* 20/44 = 45.45%) concluded that 44.5%[87] of J-M pipe would fail earlier than 100 years. *Id.* In his second examination, instead of utilizing the 3,916 LTHS result, he used the minimum LTHS figure (*i.e.* 3,830 psi) which would qualify for meeting the HDB 4,000 psi category in Table 1 of ASTM D 2837. *Id.* at 2263-64. With 3,830 psi, Paschal concluded that 12 data sets fell below the mark for 100-year useful life, which equals a failure rate of (12/44 =) 27.3%. At the suggestion of Plaintiffs' counsel, Paschal did a third comparison with the 3,830 psi figure but using an "upper confidence limit" which resulted in 8 data sets falling below the mark resulting in a 18.2% early failure prediction. *Id.* at 2341-46.

In explaining his approach, Paschal states that the AWWA C900 standard articulates steps to determine compliance but it "doesn't address how to evaluate noncompliance." *Id.* at 2435. However, he admits that he does not believe that "[t]he methodology that [he] used to compare the test results that J-M had in qualification with the subsequent E-2 tests" is set out in any standard." *Id.* at 2636. Nor is it delineated in AWWA C900 or the PPI TR-3. *Id.* at 2638. Paschal never identified whether or where his methodology (including his selection of which data

[86] While Paschal commented on the supposed ease of passing the sustained pressure test, he was aware that during the relevant time period, a J-M R&D supervisor (*i.e.* William Fassler) had sent out an email stating "Increasing failure rates in the long-term pressure test. Recently pipe from some facilities has failed sustained pressure testing at NSF. Others have failed HDB testing." *Id.* at 2241.

[87] This first percentage would sometimes be referred to as "44.5" (*see*, *e.g.*, *Id.* at 2263), and other times as "45.5" (*see*, *e.g.*, *Id.* at 2643).

sets to include or ignore, the presumption as to HDB scores as relating to a specific lifespan of manufactured pipe, etc.) was ever used before, or even as to its sources. *Id.* at 2638-41.[88] Ultimately, Paschal concedes that his expert report does not contain any reference as to where his "calculational framework" was used before and that "[i]t was done in this case specifically for this litigation to support the calculation by Mr. Lehmann [another of Plaintiffs' experts]." *Id.* at 2640-41.

Paschal states that he has never published any papers on the issue of longevity of pipe in the field. *Id.* at 2698. He has been asked on occasion to analyze the longevity of specific pipe both above ground and after it has been buried. *Id.* at 2426. Indeed, Paschal refers to a "software tool" from PPI that can be used to predict pipe lifetime. *Id.* at 2261. Paschal states that he did not use the software in this case because it assumes compliant pipe (Id.), but that doesn't explain why he did not use that tool to calculate the lifetime of compliant PVC pipe in this case, but merely picked out a lifetime of 100 years. Further, while Paschal did testify that, in a couple of cases in the last few years, he "successfully determined a pipe system's failure/lifetime using any or all of the methodology that [he] discussed in [his] testimony," "not a single plaintiff in this case . . . actually asked [him] to come and insect the pipe or even to make an evaluation of whether their pipe should be inspected." *Id.* at 2755-57.

As to his comparisons, Paschal states that he simply assumed that having LTHS results that would place the PVC material in the HDB 4,000 psi category would lead to a 100-year service life for the pipe. *Id.* at 2688. Paschal fails to provide any justification that assumption, which is problematic because it is not disputed that all of the standards and testing organizations disavow the notion that meeting their guidelines will result is any specific lifetime for the pipe nor do any of them require a certain service life of the pipe to be met. *Id.* at 2694-95. Paschal also testified that he could calculate the actual reduction in the "useful life" of pipe by the amount the HDB figure for the non-compliant pipe material fell below the 3,830 psi minimum for the HBD 4,000 psi category. *Id.* at 2206. He gave as an example that having "the delta between the 3830 and the 3600" would translate into "about 85 percent reduction in the useful life, all else being equal." *Id.*

[88] While Paschal at one point states that his comparison was just "very basic math" for which he did not think that citing a source was "necessary" (*Id.* at 2639), that comment is belied by the scores of pages in his multiple expert reports and the scores of pages of his testimony where he attempts to articulate his comparison methodology, and by the fact that he concludes with not one, or two, but three resulting percentages at the end of his calculations.

at 2206. He utterly fails to explain the actual mechanics of that calculation[89] or cite to any scientific literature justifying his computation. Further, later on in his comparison analysis, he does not utilize his claimed ability to calculate the reduction in useful life of PVC pipe by the amount its HDB falls below 3,830. Rather, he simple divides the number of data sets that purportedly fail the HDB standard by having a purported LTHS below either 3,916 psi (J-M's qualification score in 1987) or 3,830 psi (the minimum score for the 4,000 psi category) by the total number of data sets which he employs (*i.e.* 44). Why he has adopted that machination is not fully explained, and appears to be entirely serendipitous. For example, there originally were 50 data sets which he reduced to 44. He also chose not to include the 1,700 sustained pressure tests, even though they are used to determine long-term strength of pipe materials and are required under AWWA C900.[90]

Additionally, Paschal gives his findings in terms of the purported percentage of the pipe that will fail before the full service lifetime that the pipe would have had if it met the HDB 4,000 psi category. Even assuming *arguendo* the correctness of the methodology and calculations, his findings do not supply the answers to the question of actual damages in this case. To say, for example, that 27.3% of the pipe will fail before the assumed 100-year life span of compliant pipe, gives no indication as to when that failure will occur. Will it be 20 years after installation, 50 years, 99 years, etc.? That information would be necessary to establish the value of the non-compliant pipe. Additionally, Paschal fails to discuss the impact of the design/safety factors have on his conclusions. As discussed above, meeting the HDB 4,000 psi category only means that the pipe would be estimated to fail after 100,000 hours of continuous application at that tensile stress on the "wall of the pipe in the circumferential orientation." *See* ASTM D 2837 at § 3.1.5. It is the employment of the HDS design/safety factors that produces the "high degree of certainty that failure of the pipe will not occur." *Id.* at § 3.1.8. Paschal fails to consider or discuss the design/safety factors in his analysis, which negates its utility.

e) *Daubert* Ruling on Paschal

The Court would grant the *Daubert* motion as to Paschal's testimony regarding his

[89] Paschal's explanation consists of remarking that the high percentage reduction arises "because of how we are doing the mathematics and how we are presenting it on the graph, but it is on a log-log scale. So a small change on this type of scale can actually have a very significant impact on the actual numbers." *Id.* at 2207.

[90] At one point it appears that Paschal admits that with certain adjustments in the treatment of the data in the 44 sets he employs, the rate of failure could be reduced to 3 out of 44 (or 6.8%) or even down to "all of the abbreviated HDB tests passed." *Id.* at 2667-68.

application of J-M quick burst, LTS, and LTHS/HDB test results to determine the longevity and/or the reduction in longevity of J-M's PVC pipe, basically for the same reasons it gave in its rulings as to Davis and Edwards.

Paschal's testimony − regarding: (1) the relationship between short-term strength test results (*i.e*, from LTS and quick burst procedures) and HDB long-term strength (or to any measurable reduction in PVC pipe longevity), and (2) any measurable or quantifiable correlation between J-M's 44 "abbreviated HDB test results" and a diminution of longevity of non-compliant J-M PVC pipe versus compliant pipe − is rejected. First, there was no evidence that Paschal's opinions/methods have been the subject of (or based upon) scientific tests to establish their veracity or correctness. Paschal himself has not conducted any tests, nor does his methodologies follow any established guidelines regarding PVC pipe. He also has not published his theories or opinions in any peer review or other publication but, in fact, created them only for purposes of this litigation. Further, his methods and conclusions are contrary to portions of the standards and tests which he claims are the source of his methodology. Finally, his ultimate but alternative conclusions as to the percentage of J-M that is likely to fail prior to the assumed 100-year lifespan of compliant pipe (*i.e.* 45.4%, 27.3% or 18.2%) are otherwise meaningless because they are not connect to any specific estimated time as to the early failure (*e.g.*, 10 years early, 50 years, or 99 years), and they do not take into account the design/safety factors which are required to be applied by both ASTM D 2837 and AWWA C900 and C905 in order to assure that the PVC pipe will last beyond 11.4 years "with a high degree of certainty."

vii) *Testimony of Steven Lehmann*

Plaintiffs' expert Steven Lehmann is an actuary who was retained by them:

> to determine a rate-making method that would compensate plaintiffs and insure them for the cost of premature failing of the PFC pipe [sic] that they bought from J-M, and based on the fact that the pipe was not in uniform compliance with standards.
>
> And then, secondly, I was asked to apply that rate-making method to the facts of this case and determine an appropriate premium in total for all five plaintiffs and for each of the five plaintiffs.

See Testimony of Steven Lehmann ("Lehmann Test."), 11/1/28 Tr. Trans. at 5232-33, Docket No. 2863. Lehmann stated that he is not an expert on PVC pipe or PVC pipe standards. *Id.* at 5249.

In reaching his opinions as to the costs to the Plaintiffs from J-M's pipe failing prematurely and to calculate an appropriate insurance premium to cover such costs, Lehmann first indicated

that he had to estimate the proportion of the pipe that is likely to fail and then approximate the costs to replace it. *Id.* at 5253. In calculating those replacement costs, Lehmann included the expenditures to dig up the J-M pipe from the ground, to purchase new pipe, and to install the new pipe into the ground.[91] Lehmann Test., 11/1/18 Tr. Trans. at 5409, Docket No. 2854. To establish the percentage of the J-M pipe that would fail prematurely, Lehmann relied solely on the expert opinions/testimony of Davis, Edwards and Paschal. *Id.* at 5405-08, 5446. He himself did not undertake any analysis of Plaintiffs' pipe. *Id.* at 5450. As to the lifespan of compliant pipe, he chose 100 years as that seemed to be the consensus of a number of engineers in the field and also of Plaintiffs' experts. *Id.* at 5258.

As Lehmann readily admitted, his attempt to quantify the damage to Plaintiffs arising from the non-compliant J-M pipe was not based upon scientific or engineering aspects of PVC pipe but rather upon the actuarial standards, methods and practices arising from insurance coverage for losses. *See, e.g., Id.* at 5248-49, 5482 ("Q. Insurance policies. Your approach in this case has been an insurance approach, right? A. Yes."). In that regard, his efforts were to determine the losses for purposes of evaluating the risk to an insurance company of providing such coverage so that an appropriate premium could be set for providing such an insurance policy. *Id.* at 5482-87. But, Lehmann provided no basis for believing that the calculating of potential losses due to non-compliant PVC pipe for purposes of setting premiums to cover the risks of issuing an insurance policy is the same as determining actual damages under a benefit of the bargain theory in a FCA case. Moreover, Lehmann admits that he is not an expert on PVC pipe or their standards and that in his calculations he has relied upon the opinions/evidence Plaintiffs' other experts (*i.e.* Davis, Edwards and Paschal). Yet, those experts conceded that − despite their data, knowledge and expertise in the PVC pipe area − they were never able to in fact calculate the losses suffered by the Plaintiffs arising from their purchasing non-compliant J-M pipe. It is unclear how Lehmann (by merely looking at that data, but without the other experts' knowledge and expertise as to PVC pipe) purports to accomplish the task that those experts could not do.

Additionally, Lehmann stated that he has no prior experience pricing a new insurance product that covered infrastructure like pipes or buildings. *Id.* at 5249. He also indicated that

[91] Lehmann estimated that the costs to replace Plaintiffs' J-M pipe from the 1996-2006 period was $47 million "in round numbers." *Id.* at 5409.

when he went out into the marketplace to look for policies similar to the one envisioned in his testimony, "there wasn't any in existence at this time."[92] *Id.* at 5487. Lehmann also admitted that: (1) in his 40 year career, he had never previously given an opinion (as he did in this case) based on predictive models where he had no experience with the new product, and (2) he has never heard of anyone making predictions going out for decades based solely upon models that were only created for purposes of litigation (as he does in this case). *Id.* at 5502-03.

This Court would grant the *Daubert* motion as to Lehmann's testimony in three respects. First, since the Court has stricken portions of Davis', Edwards', and Paschal's testimony/opinions which Lehmann relies upon, Lehmann's testimony which is based upon that stricken evidence must also be excluded. Second, insofar as Lehmann utilizes in his calculation of Plaintiffs' damages in this case the costs of removing J-M pipe from the ground and installing new pipe (which this Court has rejected as being consequential damages which are not recoverable in Plaintiffs' FCA case, *see* discussion in Section IV(B)(3), *supra*), Lehmann's calculations are in error and cannot be considered in determining actual damages herein. As to this latter point, the jury was so instructed. *See* Phase Two Jury Instructions at 5, Docket No. 2756. Third, Lehman's use of insurance actuarial methodology to quantify Davis, Edwards and Paschal's data into purported real world longevity figures for J-M pipe is without foundation or precedent.

c. Plaintiffs' Phase Two Evidence Was Insufficient to Establish a Way to Quantify Actual Damages

In the Phase Two trial, Plaintiffs attempted to establish that the value of the pipe they received from J-M during the 1996-2006 period was worth less than what they paid for it because it would not last as long as pipe that was compliant with the three standards litigated in the Phase One trial. However, even without: (1) Plaintiffs' counsel's concession as to their inability to quantify the value of non-compliant PVC pipe (other than to incorrectly argue that it had no worth), (2) Plaintiffs' failure to establish the longevity of compliant pipe under the PVC standards which were litigated in the Phase One and Two trials (rather than simply picking a convenient number), and (3) the Court's striking of portions of the Plaintiffs' experts' testimony/evidence under *Daubert*, the Plaintiffs still failed to proffer sufficient evidence at the Phase Two trial for a

[92] The insurance policy envisioned by Lehmann had a 100-year term. *Id.* at 5483. As stated by J-M's insurance expert (*i.e.* Paul Braithwaite), a 100-year term policy is totally unrealistic for both the insurance company and the insured; and he has never seen one issued. *See* Testimony of Paul Braithwaite, 11/2/18 Tr. Trans. at 5701-02, Docket No. 2855.

reasonable jury to be able to calculate actual damages under the benefit of the bargain approach applicable herein.

There is absolutely no dispute that the three standards themselves (*i.e.* quick burst, LTS and HDB) and their promulgating/testing organizations (*i.e.* ASTM International, AWWA, PPI and UL) do not set out any predicted life span for compliant PVC pipe. Likewise, those standards do not state that any inability to meet the test criteria will result in the pipe's actually failing in normal use at some determinable point; or that the pipe material's shortfall vis-à-vis one of the three standards can be correlated to a loss in longevity - *e.g.*, if the LTHS of a pipe compound is 3447 psi (which is 10% is less than the 3,830 psi minimum LTHS for the HDB 4,000 psi category), that would mean that 10% of the pipe made with said material to fail earlier that compliant pipe and/or that a piece of pipe made with that material would last 10% less than compliant pipe. Indeed, the only language from any of the organizations regarding tests results and longevity has been to caution *against* treating a term used in the ASTM D 2837 standard that mentions LTHS at 50 years as reflecting a period of actual or expected use.[93] Despite the absence of any such data, suggestion, and/or agreement from those organizations, Plaintiffs have attempted to present evidence that non-compliant PVC pipe (according to their definition of non-compliant in regards to the quick burst, LTS and HDB standards) will not last as long compliant pipe in a measurable amount.

There is no dispute that Plaintiffs did not themselves conduct any experiments or studies to attempt to ascertain the relationship between any of the three standards and actual longevity of PVC pipe and, if there was any relationship, to determine the existence of any means to measure or calculate the effect of diminishing tests results on longevity. Likewise, Plaintiffs presented no studies or reports by persons within the industry or academia on those subjects. There was testimony in regards to studies that have been done in regards to the in-use longevity of PVC pipe

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[93] As stated in PPI TR-3 in discussing thermoplastic pipe that had been tested under the conditions set out in ASTM D 2837:

> The performance of a material (or a piping product made with that material) under actual conditions of installation and use is dependent upon a number of other factors and conditions which are not addressed in this report. * * * * The term "50-year strength value," as used in ASTM D 2837, is a mathematical extrapolation that is useful in the context of developing an HDS or HDB. It does not constitute a representation that any material with such a value will perform under actual use conditions for that period of time.

See PPI TR-3 at iii, Tr. Ex. UL-021.

generally (*see, e.g.,* Folkman Test., 10/25/18 Tr, Trans. at 4457-59[94]), but there was no testimony in regards to reports specifically relating to longevity to quick burst, LTS and/or HDB test results.

Plaintiffs did present evidence that, during the 1996 to 2006 period as to J-M C900/C905 pipe, there were reported problems as to quick burst and LTS testing results. For example, whereas the UL 1285 LTS minimum is 7,000 psi and J-M's scores were once as high as 7800 psi, in the 1996-2006 period, most of the J-M's pipes failed to meet that minimum and the scores were around 6800 psi.[95] *See* Fassler Test., 10/24/18 Tr. Trans. at 4117, Docket No. 2718; Paschal Test., 10/17/18 Tr. Trans. at 2290-91. Likewise, J-M had an internal policy of attempting to meet a 7,200 psi minimum for quick burst tests (which was above the 6,400 psi minimum delineated in the AWWA standards), but the policy was changed and the level lowered to the 6,400 psi due to J-M's having difficulty meeting the 7,200 psi figure.[96] *See* Yang Test., 10/22/18 Tr. Trans. at 3418-20, Docket No. 2851.

Plaintiffs presented evidence that certain of J-M's employees believed, based on their experience, that achieving a quick burst level of 7,200 psi was necessary to assure passing the abbreviated HDB tests. *See, e.g.,* Yang Test., 10/22/18 Tr. Trans. at 3416-17. However, no one at J-M actually performed any studies or had in their possession any reports of such studies which established any correlation between quick burst and/or LTS scores and HDB (at least none were shown to the jury during the Phase Two trial). *See, e.g.,* Fassler Test., 10/24/18 Tr. Trans. at 4220-22. Thus, in the end, all that was indicated in this portion of the trial was that certain of J-M's employees believed that there was a relationship between the short-term strength tests (*i.e.* quick burst and LTS) and HDB, but it could not be measured.[97] *See, e.g.,* Yang Test., 10/22/18 Tr. Trans. at 3434 (Q. "Did you have any − did you have sufficient data to make a precise mathematical

[94] J-M's expert (*i.e.* Folkman) testified regarding an AWWA-funded study concerning failures of PVC pipe in various municipal water systems which concluded that "installation practices are the predominant cause of early failure of PVC pipe." *See* Folkman Test., 10/25/18 Tr. Trans. at 4463.

[95] As noted *supra*, AWWA C900 and C905 standards did not require LTS testing. Hence, even though J-M pipe was generally failing the LTS tests as required by UL 1285, the pipes were sold without the UL markings. *See* Fassler Test., 10/24/18 Tr. Trans. at 4117.

[96] J-M had acquired Johns Manville's pipe division in about 1982; and it had been Johns Manville's policy to scrap pipe "with a Quick Burst below 7200." *See* Fassler Test., 10/24/18 Tr. Trans. at 4100, 4104; Yang Test., 10/22/18 Tr. Trans. at 3293, Docket No. 2841.

[97] As noted *supra*, those beliefs of certain of J-M's employees conflict with some of the language in the standards which note that short-term strength tests are not indicators of the long-term strength of PVC pipe materials.

correlation between quick burst and HDB? Long-term testing? A. Relationship, yes; mathematically, no."); Fassler Test., 10/24/18 Tr. Trans. at 4222-24 (as to the question of establishing a "connection between Quick Burst and HDB," "[t]here was no systematic data to provide a basis for that."). Additionally, none of the J-M employees offered any evidence of: (1) an established longevity of compliant pipe, (2) the reduction of that longevity due to a failure of PVC pipe to meet the standards involved in this case, or (3) any possible way to measure the reduction.

Turning to the Plaintiffs' experts' testimony, again they all said that they believed there was a relationship between the test results and longevity. However, except for Lehmann who had no expertise in the area, none of Plaintiffs' experts could articulate a damages figure arising from J-M's non-compliance with the three standards in this case.

Davis admitted that he couldn't say that there is in fact a mathematical connection between quick burst results (measuring short-term strength of PVC pipe material) and changes in HDB (measuring long-term strength of that material). Nor could he recall any studies or reports linking the two. Davis never offered an opinion that calculates the longevity of PVC pipe; rather, he merely agrees that it is very difficult to determine how long compliant pipe will last, let alone non-compliant pipe.

Edwards discusses accelerated regression methodology, Miner's Rule, and his belief that one can use an "accumulative damage model" to get the "precise relationship between this ramped-up pressure [which characterizes short-term strength tests] and this steady pressure [which characterizes long-term strength tests]. He concludes that using his approach and applying it to J-M's quick burst data for the period of 1996 to 2006, 44% of the pipe produced was non-compliant as to the quick burst requirement which would mean that the LTHS values for said non-complying pipe would be below the minimum 3,830 psi for the HDB 4,000 psi category. But then Edwards admits that: (1) his methodology has never been used outside of this litigation; (2) his approach is not accepted by any of the standards setting or testing organizations; and (3) if one were to use the AWWA's 6,400 psi minimum for quick burst tests for the C900 and C905 pipe (which were primarily the pipes involved in this lawsuit), then J-M's pipe would not be non-compliant under the applicable standard. Finally, he concedes that: (1) quick burst data cannot be used to determine HDB, but merely "reflects the HDB;" (2) his calculations of reduced LTHS are not a prediction of actual longevity; and (3) he does not make any specific predictions as to the failure of the pipes

that Plaintiffs received from J-M.

Paschal testified concerning his belief that a precipitous decline in LTS results will be accompanied by a comparable drop in HDB values. However, he then states that his work in this case does no analysis to demonstrate any quantitative relationship between LTS and HDB; and he further indicates that he has presented no data to the jury that establishes such a relationship. As to quick burst tests, Paschal again expressed a belief that a decline in those test results would suggest a degradation of long-term HDB. However, he also admits that he himself did not do any analysis in regards to quick burst results and had testified at the Phase One trial that, while there is a general relationship between quick burst values and HDB, there is not a direct mathematical equation. He never saw any correlation between a quick burst 7,200 psi value and HDB.

As to HDB, Paschal creates a methodology which has never been used before nor has it been recognized or authorized by any of the relevant organizations involved with PVC pipe. In that methodology: (1) Paschal examines J-M's available abbreviated HDB tests during the 1996-2006 time period; (2) he ignores the approximately 1,700 passing 1,000-hour sustained pressure tests that were required under the AWWA C900 standard at § 4.3.3.1; (3) of the remaining 50 abbreviated HDB tests, he rejects six as being duplicative or having data points which were so scattered that they prevented him from creating a straight regression line; (4) he takes the remaining 44 data sets and charts a LTHS value for each set; (5) he compares the charted LTHS values to: (a) the 3,916 psi figure of the last full E10 qualification for the J-M pipe material, (b) the minimum 3,830 psi figure for the HDB 4,000 psi category, and (c) the minimum 3,830 psi figure but using an "upper confidence limit" – which results in the number of failing data sets (out of the 44 examined) to be respectively: (a) 20, (b) 12 or (c) 8; and (6) he divides the number of failing data sets by 44 to reach, respectively, what he characterizes as the following percentages of J-M pipe manufactured during the relevant period which would fail earlier than compliant pipe (*i.e.* 45,4%, 27.3% and 18.2%). An initial problem with Paschal's approach is that it simply assumes facts which he should have provided some evidence or proof. For example, he presupposes without any evidence that having LTHS results which would place the PVC pipe material in the HDB 4,000 psi category means the pipe will have a 100-year service life. He takes for granted that, after ignoring the vast majority of sustained pressure tests in J-M's records, one can select 44 abbreviated HDB tests from the 1996-2006 period; calculate the LTHS for said tests; declare a certain number as "not passing;" simply divide the number of non-passing tests by 44;

and arrive at a percentage of pipe that will fail before the full service lifetime of compliant PVC pipe. Paschal provides no adequate explanation of the science behind that endeavor. Further, even assuming arguendo that Paschal's calculation has any merit, he merely gives three alternatives with no explanation as to which is the correct one. Further, even if one were to choose, one could not use that choice to compute actual damages because it fails to inform you as to *when* the non-compliant pipe will fail earlier than compliant pipe – *i.e.* is it one year after installation, ten years, 50 years, 99 years? None of the J-M pipe in the Plaintiffs' 26 projects have failed so far.

As to Lehmann, even though he admits that he has no expertise in the field of PVC pipe, he attempts to do what Plaintiffs' real PVC experts concede they cannot do, which is to provide a concrete date (or dates) when Plaintiffs' J-M pipe is expected to fail. He does so by utilizing insurance actuarial notions rather than engineering or scientific principles. But it hasn't been established that those actuarial maneuvers are applicable to calculations of PVC pipe longevity. Also, as to the computations that Lehmann did, certain portions were wrong as a matter of law, *e.g.* including replacement costs in the equations.

Finally, all of Plaintiffs' percipient and expert witnesses fail to consider or discuss the HDS concept. Plaintiffs focus on HDB in regards to pipe longevity even though the various standards and testing organizations forewarn against the use of HDB as promising a particular life span for PVC pipe. But even if one were to imprudently venture down that route, one would have to appreciate that it is *not* the HDB that supplies the degree of confidence that the PVC pipe made from the tested material will not fail in use over an extended period of time. Indeed, as stated in ASTM D 2837 at § 3.1.6, HDB is merely "one of a series of established stress values for a compound. It is obtained by categorizing LTHS in accordance with Table 1 [in the standard]." In turn, LTHS is merely the "estimated tensile stress . . . that when applied continuously will cause failure of the pipe at 100,000 h[ours]." Therefore, meeting the LTHS value of 3,830 psi, which will result in the pipe material falling within the HDB 4,000 psi category, simply means that the pipe can theoretically withstand the continuous application of 4,000 psi for 100,000 hours (or 11.4 years) before it is expected to fail. Since the proponents of PVC pipe want it to function long past 11.4 years, they have installed the use of design/safety factors which are imposed by the designers of the water systems to assure that "the estimated maximum tensile stress in the wall of the pipe" is set so that that internal hydrostatic pressure "can be applied continuously with a high degree of certainty that failure of the pipe will not occur." *See* ASTM D 2837 § 3.1.8. Thus, it is the creation

and application of the design factor to the HDB to get the HDS "which provides a service life for an indefinite period beyond the actual test period." ASTM D 2837 at § 5.5.

In the present situation for the relevant period of time as to AWWA C905 and C900 pipe, the design factors for each were set by the AWWA at respectively 0.5 and 0.4, which meant that the safety factors were respectively 2.0 and 1.5. This means that the AWWA C905 pipe was designed for uses where "the estimated maximum tensile stress in the wall of the pipe in the circumferential orientation due to internal hydrostatic pressure" would not exceed 2,000 psi. Therefore, when a contract specification called for the use of AWWA C905 pipe, it was expected that, in normal use, the internal hydrostatic pressure would not exceed 2,000 psi.

In light of the above, while it can probably be said that PVC pipe material that meets or exceeds the 3,830 psi minimum for the HDB 4,000 psi category has more long-term strength than pipe which does not meet that LTHS value, it does not mean that the former will last significantly longer in actual use than the latter, especially with the application of the design/safety factors. PVC pipe which meets or exceeds the 3,830 psi minimum will probably last longer than pipe which does not, when the situation is one where 3,830 psi is applied continuously for 11.4 years. However, in situations where the pipes are used in a water system where the estimated internal hydrostatic pressure is not excepted to exceed 2,000 psi, without further experimentation (which Plaintiffs have never done and have not located), one cannot tell how much longer "compliant" pipe will outlast "non-compliant pipe," or even say with any certainty that it is measurable.

d. Plaintiffs Have Received Value from Their J-M Pipe and Have Proffered No Evidence That They Have Suffered Any Damages

Plaintiffs have clearly and indisputably received value from the J-M pipe in the 26 projects that are the subject of the Phase Two trial. As to those projects, there has never been any failure of the pipe after between 12 to 22 years since their installations − starting in 1996 and ending in 2006, up through the end of the Phase Two trial in 2018. Thus, for every day that the J-M pipe is in the ground and functioning without incident, the Plaintiffs have gotten (and are continuing to get) the benefit of their bargain. Plaintiffs fail to entirely account for that value.

There was no testimony from any Plaintiff that it had, in fact, ever had any of J-M's pipe from the 26 projects removed and tested, even though there were statements from experts on both sides that testified such testing could be done. *See, e.g.,* Folkman Test., 10/25/18 Tr. Trans. at 4606-10; Paschal Test., 10/18/18 Tr. Trans. at 2425-26, 2755-56. Thus, there is no "real world"

evidence of defects as to the pipe.

There was no testimony from any Plaintiff that any of them had expended any moneys on repair of the J-M pipe that was the subject of the Phase One and Two trials. None of the Plaintiffs attempted to obtain any additional insurance to cover any issues with the pipe. While some of the Plaintiffs had said that they had established "reserve accounts" in regards to the J-M pipe, there was no evidence that any moneys had actually been put into those accounts; and it was clear that those accounts had been set up just prior to the Phase Two trial and many years after this lawsuit was initiated. *See* testimony/evidence set out in footnote 82 of J-M's initial Motion for Judgment as a Matter of Law, Docket No. 2729.

V. Conclusion

For the reasons stated above, the Court concludes that Plaintiffs failed to provide evidence at the Phase Two trial from which a reasonable jury could make a finding of an award of actual damages under the FCA that would not be erroneous as a matter of law, be totally unfounded and/or be purely speculative. Thus, J-M's Renewed Motion for Judgment as a Matter of Law is GRANTED.