API Ballot Summary Sheet

3/29/2005

Ballot: API 652 3rd Ed. Ballot: Lining of Aboveground Storage Tanks **AMS ID: 646**

Start Date: 2/14/05 **Closing Date:** 3/18/05 **Associate:** **Roland Goodman**

Coordinator: **Valeen Young**

Proposal: Approval of highlighted changes in API 652, 3rd edition, Draft #4.

				Vote Results			
Voter		**Company**	**Comments**	**Affirmative**	**Negative**	**Abstain**	**Did Not Vote**
109375	Jerry Boldra		Yes	X			
81149	Monica Chauviere	ExxonMobil	No	X			
130587	Darren Denning	Shell Pipeline Company LP	Yes	X			
132700	Jeff Didas	Colonial Pipeline	No	X			
85826	George Guinn	Marathon Ashland Pipe Line, LLC	Yes	X			
86222	Ron Gundry	Buckeye Partners, L.P.	No			X	
139782	Robert Niebling	ConocoPhillips	No	X			
132701	Arthur Roster	Explorer Pipeline Company	Yes	X			
132702	Mark Schilling		No				X
132704	Thomas Widin	BP Pipelines (North America) Inc.	No	X			

	Affirmative	**Negative**	**Abstain**	**Did Not Vote**
Balloting Totals:	**8**	**0**	**1**	**1**

Total Responses:	**9**	
Total Ballots:	**10**	
Response Rate :	**80%**	Must be > 50%
Approval Rate:	**100%**	Must be > 67%
Consensus:	**YES**	

API Template for Ballot Comments and Resolution

Ballot ID: 646	Date: March 29, 2005	Document: **RP 652 3rd Ed. Ballot 652-03-05**

#	(1) Voter/ Commenter	(2) Company	(3) Section No. (e.g. 3.1)	(4) Type of comment	(5) Comment (justification for change)	(6) Proposed Change	(7) Comment Resolution
1	Philip Myers	Chevron-Texaco	General	Technical	1. Tank bottoms can be very cold, a lot of failures are to improper cure due to poor ventilation and low floor temperatures. 2. They talk about amine blush which is a problem with amine epoxies. They do not talk about how to test for it. Elcometer makes the only kit for testing for the presence of Amines. #E-138. Should say that there are testing kits. 3. No mention of surface contamination of sulfates, or chlorides, and how to test for them. NACE/SSPC standard for surface contamination is in committee as we speak and should be a standard within six months.. 4. Thick film systems, with deep anchor profiles, very difficult to remove abrasive and abrasive dust from deep profile without the use of vacuum blowing down will not remove dust from valley of a deep profile in thick film systems requiring aggressive profiles.		
2	Philip Myers	Chevron-Texaco	General	Technical	I do not think that enough emphasis was placed on independent 3rd-party inspection! PS: the document did not define in the nomenclature "epoxy novolac" which is a very commonly used system today. Should be included.		
3	Chris Bashor	MPCA	General	Technical	In general, I find this to be an excellent document. It will go a long way toward helping companies with proper choice, installation, and maintenance of internal linings and coatings. One thing the document does NOT do is set up a mechanism for determining the overall lifetime of a lining, or assign standard inspection frequency or develop an interval calculation method similar to API 653. 652 identifies many good factors that if followed will tend to increase lining life. However projecting an lifetime or time to inspection is apparently intended to be left to the discretion of the owner, warranties or		

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					other factors. Of course this doesn't have to be part of 652, it would be up to the Task Group; and there is a real question as to whether this could even be done on a rational, defensible basis. I mention this because PVT-Fabrication has been monitoring the outcome of the 652 revisions, since 653 references certain linings installed per 652 in terms of 653 inspection intervals. Since for whatever reason, the revised 652 does not directly address lining life, it will be up to PVT to evaluate what credit is given for the corrosion mitigation effect of 652 linings. This also leads to my main comment on the proposed 652: I notice that throughout the document there are a number of references (listed below) to how long a "proper" lining "might" (or in one case "will") last. At times these references almost seem like marketing plugs for linings. The document needs to stay away from this, because there has been no comprehensive study or evaluation of coating life data that I am aware of. I am particular bothered by the 20-year figure that is thrown out, because a compilation of inspection data on 90 lined tanks of a single pipeline operator in Minnesota showed an average life to replacement of about 11.5 years. Numbers if used need a firm foundation; those based on anecdotal evidence will give a false sense of security to owners and can be misused. I would welcome an effort to develop a rational, data-based inspection frequency section of 652, but until that happens the document should avoid unfounded statements.		

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4	Jim Johnston	Chevron Texaco	General	Technical	1. There is not much content for the lining of tank shells and roofs. It would be of great benefit to add additional information on these applications. 2. The document seams to recommend thick film fiber reinforced linings. We are tending to go to thick film flake reinforced or unreinforced linings. In our view the fiber reinforced linings have a great issue with wicking. 3. Caulking is not defined and should have a few lines devoted to the dos and don'ts.		
5	Rick Meyer	Shell Global Solutions	General	Editorial	It is noted that the symbol µm is used in some instances instead of the expanded term - microns- suggest that it should be consistent with the definitions provided.		
6	John T. Reynolds	Shell Global Solutions, US	1	Editorial	1. Section 1 Scope, 4th para. Sentence: "They are written in .....written specifications for tank linings and vessels." Howard R. Mitschke Coating Specialist Shell Global Solutions (US) Inc. Westhollow Technology Center, PO Box 4327, Houston, TX 77210, United States of America	Change to: "...written specifications for tank and vessel linings."	
7	Darren Denning	Shell Pipeline Company LP	1	Technical	Scope, 4th paragraph. Sentence: "They are written in .....written specifications for tank linings and vessels." Change to: "...written specifications for tank and vessel linings."		
8	Michael Silverman	BP p.l.c	2	Editorial	I am surprised we are opening the door to referencing foreign standards. If one countries standards are referenced, you may be faced with multiple requests from other countries which could make that section unmanageable. Non US standards are often difficult to procure.	Limit references to US standards.	

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9	Jerry Boldra		2.1	Technical	Missing a reference in Section 2-1, i.e. RP0178-2003 Fabrication Details, Surface Finish Requirements, and Proper Design Considerations for Tanks and Vessels to Be Lined for Immersion Service. This recommended practice is referenced in Section 7.3 (top of page 17), but not included in this section of references.	Add the following recommended practice under the NACE heading: RP0178-2003 Fabrication Details, Surface Finish Requirements, and Proper Design Considerations for Tanks and Vessels to Be Lined for Immersion Service	
10	Dave Fairhurst	BP	3	Technical	No mention of “thick film reinforced lining” used in 6.3.	Add definition for “thick film reinforced lining”.	
11	Marilyn Shores	Sunoco Logistics	3	Technical	There is no definition for reinforced linings.	Add a definition of reinforced linings.	
12	Jim Johnston	Chevron Texaco	3.12	Technical	Coating and linings are defined as the same for purposes of this document and they are internal systems. What is the external coating system defined as?	Coating - Coating and lining are used interchangeably throughout the document. In addition, a coating refers to the material applied to the external surface of a tank to serve as a barrier to corrosion.	
13	Bruce Roberts		3.24	Technical	3.24 lining: A coating material applied bonded to the internal surfaces of a tank to serve as a barrier to corrosion and/or product contamination by the contained fluids. The term coating is also used for the purposes of this document. This definition isn’t clear. Suggest the following: A material applied to the internal surfaces of a tank to serve as a barrier to corrosion and/or product contamination by the contained fluids. The terms “coating” and “lining” are synonymous in this document. Of possible interest, API-650 will be using the term “coating” in lieu of lining to cover all applications of these materials.		

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14	Marilyn Shores	Sunoco Logistics	3.24	Technical	Your attempt to clarify the internal corrosion aspect has actually muddied the waters.	A material applied to the internal surfaces of a tank to serve as a barrier to corrosion by the contained fluids and/or to product contamination.	
15	Rick Meyer	Shell Global Solutions	3.3.1	Technical	(0.51 mm) to read 510 microns		
16	Rick Meyer	Shell Global Solutions	3.3.2	Technical	(0.51 mm) to read 510 microns		
17	Jim Johnston	Chevron Texaco	4.1	Technical	Rain water enters the tank through the seals. This is a major source of water in an external floating roof tank.		
18	Jim Johnston	Chevron Texaco	4.2	Editorial	Prevalent has an extra space.		
19	Jim Johnston	Chevron Texaco	4.3	Technical	The sentence does not make sense to me.	The area under a surface deposit may be exposed to a small volume of an electrolyte, which will become depleted of oxygen.	
20	Dave Fairhurst	BP	4.4	Technical	Painting undersides of bottom plates common.	Add to last sentence: “…..unless undersides of plates are to be painted”	
21	Jim Johnston	Chevron Texaco	4.4	Editorial	First Line on page 7: Welding can cause many problems that need to be addressed. A change in microstructure is one of these, but is not generally a problem.	Welding can in some cases produce large differences in the microstructure of a steel bottom plate and this can result in a built-in galvanic couple.	
22	Roland Goodman	American Petroleum Institute	5.4	Technical	Last sentence - use of the phrase "should never" in this sentence should be avoided.	"The use of wood under a tank floor is not recommended given that it promotes bacterial activity and will cause accelerated corrosion."	
23	Jim Johnston	Chevron Texaco	5.4	Technical	Many objects in a tank foundation fill material will cause accelerated corrosion. Why is only wood singled out?	It is critical that there are no foreign materials contained in the tank pad material and prior to the installation of the bottom the pad should be inspected to ensure the pad has not been contaminated. Some, but by no means all of the materials of concern are clay, rocks, welding electrodes, paper, plastic, and wood.	

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24	John Lieb	Tank Industry Consultants	5.4	Technical	There are many existing tanks with wood under the tank bottom. While I agree that it is good practice to disallow wood under new tank bottoms, I think the wording "never be allowed" is a bit strong, as some tanks with treated wood under the bottoms have not experienced significant corrosion.	Change "never be allowed" to "not be used".	
25	Domingo dePara	Not Provided	5.4	Technical	Paragraph states "wood should never be allowed under tank floor", yet API 650 Appendix B and I have for many years permitted use of asphalt impregnated board to be used under the bottom near the shell...	mention that it is permissible to use an asphalt impregnated board at locations shown in API 650 Appendix B and I...	
26	Marilyn Shores	Sunoco Logistics	5.4	Technical	You are taking this document too far. Underside corrosion is another full topic. If we are to state that wood under a tank floor is a problem, we should extend this to say that the felt material between the ringwall and the chime can also trap water, ...	Delete the full second Paragraph. Or at the very least, delete the last sentence. We could add a statement that tracking in clay from the surroundings initiates corrosion cells.	
27	Rick Meyer	Shell Global Solutions	6.1	Technical	(0.51 mm) to read 510 microns		
28	Dave Fairhurst	BP	6.2	Technical	Table 1, Footnotes-Use of primer can make valuable contribution to progress of a tank lining project.	Add footnote: ”While a primer may not be considered necessary from standpoint of performance it’s use can be advantageous in progressing lining work particularly in very large tanks. Primers are applied quicker and dry much faster than high build coatings and allow work to proceed much earlier in adjacent areas."	
29	George Guinn	Marathon Ashland Pipe Line, LLC	6.2	Editorial	5th line.	Suggest rewording to read "... should be in accordance with NACE 11/SSPC-PA8 and it should be given..." (i.e. delete the 2nd reference to NACE No. 11/SSPC-PA8 and replace with the word "it").	
30	Arthur Roster	Explorer Pipeline Company	6.2	Editorial	Remove sentence (Installation of thin film linings should be in accordance with NACE 11/SSPC-PA8). Above sentence is prescriptive	New Paragraph: NACE No. 11/SSPC-PA8 should be given careful consideration when designing and installing a thin-film lining system for steel bottom tanks.	

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31	Jerry Boldra		6.2	Technical	Item d: The title of this section is “Limitations of Thin- Film Linings”. Item d says “Thin-film linings require the application of several coats. However, “Note A” under Table 2 refers to thick film linings and says “Generally applied . . . in several coats”. Therefore “Multiple coats” are required for thin-film and thick film linings . . . and “multiple coats” is not a “Limitation of thin-film linings”.(J. Boldra)	Delete Item d.	
32	Jerry Boldra		6.2	Editorial	Last three lines just above Table 1 . . . seems to be one sentence, but it doesn’t make sense. Seem like the first 12 words should be deleted. (J. Boldra)	Delete “Installation of thin-film linings should be in accordance with NACE 11/SPCC- PA 8. and”	
33	Marilyn Shores	Sunoco Logistics	6.2	Technical	Repeating the NACE No. 11/SSPC-PA8 reference is confusing.	Installation of thin-film linings should be in accordance with NACE 11/SSPC-PA8 and this document should be given	
34	Chris Bashor	MPCA	6.2.1	Technical	Item c. Delete. No basis for 20 years, and the words "can" and "not damaged" undercut the value anyway.		
35	Philip Myers	Chevron-Texaco	6.2.2		More likely to have solvent entrapment, longer cure times Thick film matt systems. Edges should be coved with an epoxy putty or a sand filled epoxy putty to insure a smooth transition and allow the matt to lay down flat. Dry glass can also be a problem, if left that way product will wick into system. Blisters are also a problem. Short recoat times can also be a problem.		

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36	Jim Johnston	ChevronTexaco	6.2.2	Technical	a. API 653 requires bottoms with thin film linings to have a minimum thickness of 0.1 inches at the next internal inspection interval. c. Thin film linings typically require additional surface preparation. Thin film linings are more sensitive to notches and sharp edges, and typically require grinding or caulking of rough welds and areas with weld spatter. f. Thin film linings require the control of the atmospheric moisture between coats to prevent amine blush.		
37	Jerry Boldra		6.2.2	Technical	Item F: Amine blush is a detrimental characteristic that can happen to all epoxies, not just thin-film epoxies. Some epoxies are more susceptible to amine blush because of the curing agent chosen, not because of the film thickness. Curing agents have different susceptibilities to amine blush, approximately in this order: less susceptible: amine adducts, polyamides, polyamines, amines: most susceptible. .Amine blush is an "equal opportunity" hazard and is just as much of a problem for multi-coat thick-film epoxy linings as multi-coat thin film linings. (J. Boldra)	Deleted Item F from “Limitations of Thin-Film Linings”.	
38	John Lieb	Tank Industry Consultants	6.2.2.c	Technical	Caulking should be compatible with the stored liquid as well as the lining product in the event that the lining is breeched.	Add "and the liquid product" between "...lining product" and "may be used...".	
39	John Lieb	Tank Industry Consultants	6.2.2.e	Technical	Is "evolution" the correct word in the first sentence? I'm not sure that "evaporation" is an appropriate substitute in this context, but the sentence seems unclear to me with the word "evolution". Since evaporation is not always the mechanism, perhaps "transition" would be a better word.	1) Leave "evolution" but delete "from the film" in the first sentence. 2) Substitute "transition" for "evolution" and delete "from the film" in the first sentence. 3) Replace "evolution" with "evaporation" if that is the correct word.	

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40	Dave Fairhurst	BP	6.2.2c	Technical	Requires clarification of last sentence.	Amend to: “In the optimum situation…….and not part of the lining contractor’s work. In practice however removal of weld spatter, rough capping etc, is normally required as part of the surface preparation workscope prior to coating application”.	
41	Roland Goodman	American Petroleum Institute	6.2.2c	Technical	Last sentence - change "In the optimum situation" to "Optimally" and the word "work" to "responsibility".	"Optimally, requirements for weld surface quality are part of the welding specification and not part of the lining contractor's responsibility."	
42	Rick Meyer	Shell Global Solutions	6.2.2c	Technical	Change should to shall ...."holidays, therefore, weld surfaces shall be relatively smooth and weld spatter removed before"..... Delete - "In the optimum situation" - Read as - "Requirements for weld and local parent metal surface quality are part of the welding/construction specifications and not the lining contractors work. However it is incumbent upon the lining contractor to access the suitability of the surface to be lined in respect to assuring the maximum life expectancy performance of the coating to be applied".		
43	Dave Fairhurst	BP	6.2.2d	Technical	This disadvantage of multi-coat systems requires expanded.	6.2.2.d-Amend to : “Thin film linings require application of multiple coats and as such recoat times have to be respected, and risk of intercoat contamination exists”.	
44	Marilyn Shores	Sunoco Logistics	6.2.2e	Technical	The wording on solvents is a little strong, considering that most products used for thin film linings are 100% solids.	Add wording to reflect 100% solids.	
45	Dave Fairhurst	BP	6.3	Technical	Paragraph 2 & 3-Confuses fillers and flake pigmentation (part of a coating formulation, added mainly for impact & abrasion resistance) with fibers (added during application to provide flex. & tensile strength).	Paragraphs 2 & 3-Consider replacing both with single sentence on virtues of fiber reinforcement otherwise, delete altogether.	

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46	Dave Fairhurst	BP	6.3	Technical	Paragraph 5-Not clear why or how this spec. should be given careful consideration and confuses reader.	Paragraph 5-clarify statement or delete.	
47	Dave Fairhurst	BP	6.3	Technical	Paragraph 9-Repeats what is said in Footnote b to Table 2.	Paragraph9-Delete.	
48	Dave Fairhurst	BP	6.3	Technical	Last Paragraph-Customary to apply a filled epoxy resin grout to profile floor to wall transition.	Add "This may include application of a sand filled epoxy resin fillet to profile floor to wall transition."	
49	Jim Johnston	Chevron Texaco	6.3	Technical	A typical application a. Spray application of a resin base coat and allow to cure. 10 to 20 mils. The current line a. becomes b. c. delete air entrapment and add entrapped air d. add total thickness at the end		
50	Jim Johnston	Chevron Texaco	6.3	Editorial	Second Paragraph 3rd and 4th lines; What is tiny?	With small particle fillers the tensile strength of the filler is of little consequence, since the small reinforcing particles only restrain movement of the matrix immediately adjacent to the particle.	
51	Jim Johnston	Chevron Texaco	6.3	Editorial	Page 12, 1st Paragraph last line.	Delete the word strength.	
52	Jim Johnston	Chevron Texaco	6.3	Editorial	Page 12, 3rd Paragraph.	For tanks containing a water layer on the bottom, the maximum temperature will be at the lower end of the range specified in Table 2.	
53	Jerry Boldra		6.3	Editorial	Note B under Table 2: The comment about " . . . water layer on the bottom . . ." in this Note B is duplicated 18 lines down.	Delete the second comment 18 lines below Note B.	

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54	John T. Reynolds	Shell Global Solutions, US	6.3	Technical	2. Sec 6.3 Thick-Film Reinforced linings. I appreciate the addition of the new Paragraph on reinforcement capabilities of fillers vs. fibers. There is no doubt that small particle fillers do not "meet the definition" of reinforcement. And it is clear that fiberglass products would meet the definition of reinforcement. However, the inclusion of organic fibers in the first Paragraph opens the door to a new type of lining: those containing organic microfibers. The industry needs guidance as to whether or not linings containing microfibers can be included in the same category as reinforced linings. I know the committee is reluctant to go too far into this issue because the intent of this document is not to rely on reinforced linings to bridge over holes. Nevertheless, API guidelines still give allowance to go to 50 mils metal thickness for the reinforced linings. So some clarification on the use of microfibers would certainly be welcomed. Are microfibers considered the same or nearly the same as the particle fillers and therefore do not meet the definition of reinforcement? Does the committee feel they can be used if they demonstrate significant bridging capabilities? Or does the committee feel that there is insufficient information on this material at this time to include them in the reinforcement definition? Howard Mitschke Shell Global Solutions, US Coatings Specialist		

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55	Darren Denning	Shell Pipeline Company LP	6.3	Technical	Thick-Film Reinforced linings. I appreciate the addition of the new Paragraph on reinforcement capabilities of fillers vs. fibers. There is no doubt that small particle fillers do not "meet the definition" of reinforcement. And it is clear that fiberglass products would meet the definition of reinforcement. However, the inclusion of organic fibers in the first Paragraph opens the door to a new type of lining: those containing organic microfibers. The industry needs guidance as to whether or not linings containing microfibers can be included in the same category as reinforced linings. I know the committee is reluctant to go too far into this issue because the intent of this document is not to rely on reinforced linings to bridge over holes. Nevertheless, API guidelines still give allowance to go to 50 mils metal thickness for the reinforced linings. So some clarification on the use of microfibers would certainly be welcomed. Are microfibers considered the same or nearly the same as the particle fillers and therefore do not meet the definition of reinforcement? Does the committee feel they can be used if they demonstrate significant bridging capabilities? Or does the committee feel that there is insufficient information on this material at this time to include them in the reinforcement definition?		
56	Marilyn Shores	Sunoco Logistics	6.3	Technical	This Paragraph is greatly expanded, but is now too wishy-washy.	End of second new Paragraph - Only fiber-reinforced linings are well proven to have hole-bridging capability and therefore accomplish reinforcement as defined in API Std. 653.	
57	Philip Myers	Chevron-Texaco	6.3.1		Item G Matt systems can have more holidays due to improper wetting due to dry glass.		

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58	Chris Bashor	MPCA	6.3.1	Technical	Item i. Delete. Item h. Should either be deleted, or possibly be rewritten to make clear that the reduced inspection interval is only per API 653, 6.4.2. Table 1.		
59	Jim Johnston	Chevron Texaco	6.3.1	Technical	See proposed revisions	a. Thick film reinforced linings require less surface preparation as they can be applied over rough and pitted surfaces. b. Thick film reinforced linings can bridge perforations that may occur in the tank bottom. c. Thick film reinforced linings are more resistant to mechanical damage. g. thick film reinforced linings typically have fewer holidays h. Thick film reinforced linings typically have a longer service life. This can reduce turnaround cycle and total cost of ownership. j. thick film reinforced linings typically have a greater resistance to moist penetration Delete d, e, f, and i.	
60	Doug Moore	Carboline Company	6.3.1	Technical	Section 6.3.1 includes the following advantages of a thick-film reinforced lining. Item "f" appears to be a duplication of what is already listed in item "a".	I recommend eliminating item "a" or "f".	

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61	Rick Meyer	Shell Global Solutions	6.3.1	Technical	f) Repeated see c). g) The statement is a bit subjective - suggest to delete as holiday testing is a requirement on all lining systems anyway. Surface cleanliness and skill of the applicators will be the main contributing factors in the presence of holiday. h) How? Thin films are easier to apply and will allow turnaround in a shorter duration - should be removed. i) Delete - "resulting in low life-cycle costs" - this is subjective and is dependant on the quality of the initial application. Thin films also offer a life expectancy of 20 years if applied correctly.		
62	Jerry Boldra		6.3.1	Editorial	Items A, D and F are the same. Coverage over rough surfaces is listed three times. (J. Boldra)	Delete Items A and F	
63	Jerry Boldra		6.3.1	Editorial	Items H and I say the same thing in different words. (J. Boldra)	Either combine or delete one	
64	Jerry Boldra		6.3.1	Technical	Principal advantage b. “A The title of this section is: “Advantages of Thick-Film Reinforced Lining”. The advantage of “ . . . bridging over perforations . . .” is written in the Paragraph above and discussed. It is a duplication to include it as Note B. (J. Boldra)	Delete Note B	
65	Jerry Boldra		6.3.1	Editorial	The word “Lining” should be plural. All the other titles below that describe advantages or limitations are plural. (J. Boldra)	Add an “s” to “Lining”	
66	Doug Moore	Carboline Company	6.3.1h	Technical	Item h lists "Promotes a reduced tank turn around schedule" as an advantage of the thick-film reinforced lining system. I am not sure the logic here considering the thick-film reinforced lining includes at least three coats of thick lining material with a hand application of glass mat. I assume the term "tank turn around schedule" means put the tank back in service faster. Perhaps the philosophy is that the system can be employed in lieu of tank repair.	I recommend the item be clarified or dropped.	

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67	Dave Fairhurst	BP	6.3.2	Technical	6.3.2-No mention here of incompatibility of thick film reinforced linings with CP.	6.3.2-Add an additional item: “Due to practical application difficulties around anode supports, thick film reinforced linings not normally compatible with cathodic protection.”	
68	Jim Johnston	Chevron Texaco	6.3.2	Technical	Add an item e. Thick film reinforced linings are difficult to inspect to determine the quality of the barrier provided.		
69	Roland Goodman	American Petroleum Institute	6.3c	Editorial	Suggest changing order of words in this sentence.	"Roll the resin into the mat using ribbed rollers to fully saturate it and remove entrapped air."	
70	Dave Fairhurst	BP	6.4	Technical	6.4 2nd sentence-Implies it is an acceptable practice to use thick film. reinforced linings to bridge holes in tank floors, which is wrong.	Amend to: "However, un reinforced thick film linings, have poor flexural and tensile strength and may crack at highly stressed areas such as floor to wall transitions and poor fit up between adjacent floor plates. Are also less likely to provide fluid containment should floor perforate from underfloor corrosion.”	
71	Philip Myers	Chevron-Texaco	6.4.1		Blushing and exceeding the maximum recoat time is still a concern during lining repairs after holiday testing.		

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72	Jim Johnston	Chevron Texaco	6.4.1	Technical	Thick film unreinforced linings can be applied in one coat, which reduces installation time. Thick film unreinforced linings require less surface preparation as they can be applied over rough and pitting surfaces. Thick film unreinforced linings have better edge retention with less shrinkage. Thick film unreinforced linings have a reduced cure time, which shortens the coating window. Thick film unreinforced linings have fewer holidays and require fewer repairs. Thick film unreinforced linings have a reduced installation cost. Thick film unreinforced linings typically have a longer service life. Thick film unreinforced linings typically have the greatest resistance to moisture permeation.		
73	Rick Meyer	Shell Global Solutions	6.4.1	Technical	(microns) to read (2540 microns)		
74	Chris Bashor	MPCA	6.4.1.	Technical	Item i. Delete. Item h. Delete--no credit in 653 for un-reinforced linings.		
75	Jim Johnston	Chevron Texaco	6.4.2	Technical	Delete item e. This statement is true for all lining.		
76	Jim Johnston	Chevron Texaco	6.5.2	Editorial	See proposed revision.	With many refined products, such as gasoline, jet fuel, lubricating oils, solvents and other petrochemical products, tanks may be internally lined primarily for product quality and not corrosion protection. However, there are circumstances that both product integrity and corrosion protection are required. Coatings that are certified ….	

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77	Jerry Boldra		6.5.2	Technical	Third Paragraph: There are two references to "fiber-grade" ethylene glycol, one on line 2 and the other on line 5. Ethylene glycol is a liquid . . . is "fiber-grade" the correct term? ? ? (J. Boldra)	Verify that "fiber-grade" is the correct term.	
78	Chris Bashor	MPCA	6.5.4.	Technical	Delete second sentence -- same reasons. The third sentence makes the point that needs to be made about changing service.		
79	David Burch	Burlington Resources	7	Other	These sections deal with the standard cleaning of surfaces and the preparation before coatings are applied. We have used a new process that used liquid nitrogen to remove all traces of the existing coating while profiling the surface areas to a clean white metal finish. Do we need to address this new process?		
80	Dave Fairhurst	BP	7.1	Technical	7.1 Paragraph 2-Cross reference to 7.5 required.	7.1 Paragraph 2-Insert cross reference.	
81	Dave Fairhurst	BP	7.2	Technical	Last Paragraph, 4th Line-Needs clarification.	Last Paragraph, 4th Line-Amend to "Typically, the part of this specification dealing with ultra high pressure water blasting refers to substrates that already possess an acceptable surface profile (see Clause 7.5) and in exceptional circumstances, do not require abrasive blasting	
82	Jerry Boldra		7.2	Technical	Line 8: The Draft text says, " . . . adversely affect the performance of a thin film lining resulting in blistering by osmosis". This is true of ALL linings, not only thick film linings. (J. Boldra)	Delete the reference to "thin film" and edit the sentence to apply to all linings.	
83	Marilyn Shores	Sunoco Logistics	7.2	Technical	I would want to remove all residue, whether it was hydrocarbon or not.	Before abrasive blasting, all residue, such as oil.....	
84	Dave Fairhurst	BP	7.7	Technical	Test method exists for assessing degree of surface contamination.	Reference ISO 8502-3.	

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85	Jerry Boldra		7.7	Technical	Last sentence: Using “vacuum cleaning” in conjunction with “blow-down surfaces” defeats the benefit of vacuum cleaning. Vacuum cleaning removes the dust from the tank. But when compressed air is used to blow the dust away from surfaces, much of the dust goes into the air and some of it settles back on the tank bottom before lining material can be applied to the entire surface. If vacuum cleaning is specified, blow down cleaning should not be used “in conjunction with” vacuum cleaning. (J. Boldra)	Delete the last ten words at the end of the last sentence.	
86	Dave Fairhurst	BP	8.1	Technical	See comment on Table 1 footnotes.	Mention benefits of primers in progressing work.	
87	Jerry Boldra		8.3	Technical	Very last sentence An additional advantage is missing. (J. Boldra)	Add one more sentence: “Improved productivity due to better working conditions is a secondary benefit.”	
88	Philip Myers	Chevron-Texaco	8.5		Curing, temperatures should also be a major concern during curing, some epoxies stop curing below sixty degrees so ventilation and maintaining temperatures is critical.		
89	Bruce Roberts		9		Quality Control Inspection "Inspection" is a better title.		
90	Philip Myers	Chevron-Texaco	9.1		Surface preparation, application, and holiday and dry film thickness testing.		
91	John Lieb	Tank Industry Consultants	9.1	Technical	Why change "recommend" to "strongly recommend"? This change does not add anything to the standard in my opinion.	Leave first sentence as-is.	

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92	Jerry Boldra		9.1,	Technical	Second sentence: Draft text says, "The lining should be inspected during application and upon completion of the work." It is misleading to use the word "application" as written here. At best, application could mean the entire lining process up to the end of the job, but most would read it to mean only the spreading of the lining material. Inspection should also be performed before the work is started to look for oil/grease on surfaces, during mixing, during surface preparation, etc.	Delete the work "application" and substitute: "all work phases"	
93	Philip Myers	Chevron-Texaco	9.2		SSPC does not certify inspectors.		
94	Philip Myers	Chevron-Texaco	9.3.1		Surface contamination, cleanness of blast profile prior to lining application, sulfates and soluble salts, oil in compressed air.		
95	Dave Fairhurst	BP	9.3.1	Technical	No mention of salt or dust contamination checks.	Include dust and salt contamination measurements at a representative frequency.	
96	Philip Myers	Chevron-Texaco	9.3.4		100% holiday testing of coated surfaces and rechecked after repairs are complete.		
97	Chris Bashor	MPCA	10.1	Technical	Delete first two sentences. First sentence is particularly excessive.		
98	Jerry Boldra		10.1	Editorial	There are two periods at the end of the 4th line. (J. Boldra)	Delete one period.	
99	Jerry Boldra		10.3	Technical	Two criteria are missing. (J. Boldra)	Insert these two criteria, a. How long has the existing lining been in-service? b. How well has the existing performed to date? Re-letter the remaining three criteria as c. d. e.	

NOTE Columns 1, 2, 4, 6 are compulsory.

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100	Dave Fairhurst	BP	10.6.1	Technical	Coatings applied over ptc steel have a lifespan a fraction of those over blasted steel.	Add word of caution regarding shorter lifespan from lining applied over ptc steel compared to over blasted steel and ptc is only appropriate for v.small areas of damage in otherwise intact linings.	
101	Jim Johnston	Chevron Texaco	10.6.1	Editorial	Revise last line.	For thin-film linings in good condition, open blasting in a tank is not advised, as the removal of the abrasive material often damages the existing lining.	
102	Jim Johnston	Chevron Texaco	10.6.3	Editorial	See proposed revision.	Thick film reinforced linings can be top coated to extend the life of an existing coating that has good adhesion and integrity. The top coat is applied to ensure the fibers are not exposed to the product. Accepted practice ….	
103	Marilyn Shores	Sunoco Logistics	10.6.3	Technical	You have replaced the term "cargo" with "service" throughout the document, but missed it here.	Topcoating is ... protecting it from degrading effects of the service.	
104	Chris Bashor	MPCA	11	Technical	Delete two introductory paragraphs and consider putting 11.1 and 11.2 into section 6. The purpose of Section 11 is a bit vague. 1st para. is more in the province of API 653 to determine; it is also not true that a topside coating allows service interval to be maximized by itself, because bottom side corrosion and other factors play a major role. The second para. are good points to make, but they don't really lead anywhere. 11.1 and 11.2 are very helpful, but doesn't contractor selection belongs more with coating selection?		
105	Bruce Roberts		12		Section 12 should add a statement that all references to U.S. Federal and OSHA standards may be substituted with equivalent national standards for tanks located outside the U.S.		

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106	Jerry Boldra		12	Technical	We forgot to add a section on "Records". Records of "what" was installed and "how it was installed", are important when the tank is opened next time. If records are not made, next time the tank is opened, the coating inspector and owner will be able to see how the lining has performed but they won't know what the product was, nor how it was installed. Also, if repairs are needed, the probability of successful repairs will be significantly enhanced if records of the existing lining are available. (J. Boldra)	Suggest adding the following section on "Records" as Section 12. And re-number the "Safety" section as 13. 12. Records (title) Records should be made to briefly describe the products and procedures that were used during installation of the lining. Records will be important next time the tank is opened to associate the lining product and installation process with the lining performance. Records will also be valuable if repairs are needed and a repair product and repair procedure must be developed. The following form is a minimum record of information about the product(s) applied and the procedure used to install a lining. It should be retained for the life of the lining. Attachment sent to Roland Goodman via separate email.	
107	Marilyn Shores	Sunoco Logistics	12.1	Technical	Second Paragraph - Trying to merge these two sentences has produced poor grammar.	Second Paragraph - Some of this information is presented in regulatory and industry documents. Other general safety concerns are emphasized in 12.2 through 12.4 of this document.	