Minutes --API 581 Task Group on Risk Based Inspection

2:00 pm – 5:00 pm, Tuesday April 28, 2009
Grand Hyatt Denver, Denver, CO.
K. M. Gottselig, Chairman

Agenda Item	Action	Status
1. **OPENING / INTRODUCTIONS / ATTENDANCE SHEET / ROSTER** Ken Gottselig – LyondellBasell Mark Geisenhoff – Flint Hills Greg Alvarado – Equity Eng Masaaki Oka – SHI Examinations & Inspection Ltd Alfonso Ramos – Lloyd's Register Capstone Jim Widrig – Quest Reliability Ben Sloan – Chevron Jonathan Kniss – Quest Integrated Mark Carte – Olympus NDT Colin Gaspard – Mistras Group Ray Lewis – Rosen USA Victor Escobar – Rosen USA Roy Schubert – Shell Canada Energy Neil Ruegsegger – Chevron David Anderson – Mistras Group Jesus Esquivel – Comimsa Nick Sowa – Mistras Group Eydstein Egholm – Chevron David Osage – Equity Engineering Group Lisa Roberts – ConocoPhillips John Britton – DNV Joe Krynicki – ExxonMobil David Wang – Shell Fahad Alblaies – Aramco Services	None	complete
2. **APPROVAL OF AGENDA** Agenda was approved	None	complete
3. **APPROVAL OF MINUTES FROM LAST MEETING** Copies of all minutes can be obtained from the API website at http://committees.api.org/standards/cre/sci/minutes/minhm.html	None	complete

4. UPDATE ON LAST MINUTES AGENDA ITEMS WITH ACTIONS **UPSTREAM RBI CONCERNS** A separate group in the Upstream area is being tasked with the upstream RBI work. See the attached letter from John O'Brien (SCI Chairman). All members with upstream interest are asked to contact this group. **REMAINING STRENGTH FACTOR (RSF) APPROACH UPDATE - FUNDING** Gerrit Buchheim presented the RSF approach work for Phil Henry. The group agreed that this was the way to proceed for POF calculations. The presentation on the RSF approach is attached to the minutes. It was estimated that this effort would take about 2 years to complete. UPDATE 2009-04 FUNDING OF THIS PROJECT WILL BE THROUGH THE EQUITY ENGINEERING AND/OR THE API SOFTWARE USERS GROUP. THIS GROUP WILL BALLOT THE TECHNICAL WRITEUP.	Ken Gottselig	Complete
A PRELIMINARY PROGRESS REPORT TO THIS GROUP WILL BE MADE AT THE NOVEMBER MEETING.	Dave Osage	November API meeting
5. UPDATE ON FUNDING FOR 581 GROUP Discussed the funding write-up for 2009. It was requested to add ABS Consulting to the bidder list and also add requirements for a detailed schedule. Final copy is attached to the minutes and has been sent to API. Discussions on the action log were completed to obtain a list of items that require funding for 2010. It was agreed that the following items should be written up in a RFQ and to obtain bid results by the November meeting. Ken Gottselig will write up a RFQ for the following items. 2009-006, 2008-011, -017, -019, -020, -024, -025, -027, -040, -053, -054	Ken Gottselig	Schedule added. ABS added Issue RFQ to API by September 1, 2009
6. EXTERNAL STRESS CORROSION CRACKING METHODOLOGY Proposal for new methodology for evaluating the risk for external stress corrosion cracking (insulated and non-insulated) was presented. Concern areas discussed: • COF calculation is different than all other modules and as a result how do you compare relative risk to other damage mechanisms? • Should chloride content of insulation be part of the POF calculation • The matrix form needs to be converted to an iso risk approach		
All members were requested to discuss procedure with their companies and feed back specific questions / comments to Ken Gottselig	All	June 15, 2009

7. REVIEW OF ACTION LIST The action list was updated and is attached. Actions: • 2008-013 Gottselig to forward Britton email to Egholm. E. Egholm to complete • 2008-037 Geisenhoff to create ballot • 2009-007 Geisenhoff to create ballot • 2009-003 Egholm to create ballot • 2008-012 Group agreed to review Table 5.17 outage days		For all ballots, send to Gottselig by June 15, 2009
8. **BALLOT RESOLUTION** A ballot 581-2008-003 was reviewed with no changes. Ballots created in item 7 will be sent out for vote in the August time frame. Review of ballot results at the November 2009 API meeting.		
9. **NEW BUSINESS**		
10. **NEXT MEETING** **Fall Refining and Equipment Standards Meeting** November 9-11, 2009 Hyatt Regency Dallas, Dallas, Texas		
11. **ADJOURNMENT** • Meeting was adjourned at 4:55 pm		

Letter on RBI for Upstream Assets

To: API RP 581 Task Force on RBI
From: John O'Brien Chair SCI

Subject: Inclusion of RBI for Upstream Assets Into RP 581.

The subject matter of expanding API RP 581 into the upstream sector has been pursued at length both with the CRE and the Upstream Standards committees. The following is the direction we have received.

API RP 581 is a downstream document primarily supported by volunteers and SMES from the downstream sector. The CRE and the Upstream Committee feel that there is significant difference between downstream and upstream such that API RP 581 shall not be expanded into the Upstream Sector.

There has been a separate initiative to have RBI recognized in the E&P section of API 510 and the Upstream Committee has now acknowledged that this may need to be looked at along with other inspection proposals for the upstream documents.

A small working group is being formed to pursue those tasks. Joey Poret (jjpj@chevon.com) is leading that effort supported by Chris Payton of BP. We are looking for more Upstream folks to join that small work team so if any of the upstream people participating at 581 would like to contribute please have them contact Joey Poret.

I will have the work team keep the 581 task force updated on progress.

Attachment #1

American Petroleum Institute
1220 L Street
Washington DC

Attention: David Soffrin
Manager Downstream Standards

Subject:

The American Petroleum Institute is seeking request for proposals for.further technical development for API RP581, "Risk-Based Inspection Technology". The 2nd edition of API RP 581 was published in September of 2008 and consisted of a major rewrite to the 1st edition. During the balloting phase of the 2nd edition, numerous technical issues were brought up, many of which had to be tabled to facilitate getting the document published in a timely manner.

A prioritized action item log for these tabled items has been developed by the 581 task force chairman. This proposal is to provide technical development for several of the highest priority items and create ballots as necessary to modify API RP 581.

Proposals are sought from either companies or individuals knowledgeable and experienced in the subject matter contained within this document. Bidders shall include a schedule plan with dates for the completion of each item.

Scope of Work:

Six action items are covered in this proposal. For each item, the proposal is to include development of technology, presentations of the technology to the task force (if necessary), creation of ballots for API 581 and any rework required as part of the balloting process.

- 2008-004 – Heat Exchanger Bundle Inspection Effectiveness

  The current methodology in API 581 does not include an inspection effectiveness table for heat exchanger bundles. An inspection effectiveness table for several damage mechanisms will be created and added to 581.

- 2008-005 and 2008-010 – Modification to Account for Product Form When Determining Cracking Susceptibility

  Wording in API 581 notes that the susceptibility for HIC/SOHIC – H_2S and HIC/SOHIC – HF changes with respect to the product form, e.g. plate versus pipe. However, this logic is not built into either the look-up tables for the severity index nor the flowchart to determine damage factor. Methodology to account for product form will be developed and added to the calculation procedure and the flowcharts.

- 2008-006 – Development of TNO Multi-Energy Method for Modeling of Explosions

  API 581 currently uses the TNT Equivalency method for modeling the effects of explosions, which is considered to be conservative for locations in close proximity to the blast wave. This method does not take into consideration the plant congestion when establishing the magnitude and/or probability of the explosion. This effort will investigate the TNO Multi-Energy method and recommend changes necessary for inclusion of the method into API 581.

- 2008-007 – Development of Probability of Ignition as a Function of Flash Temperature

  The current methodology for prediction of probability of ignition (POI) of hazardous fluids released to the atmosphere is based on work from Cox, Lee and Ang, however, the method used in 581 is strongly dependent on the released fluid's molecular weight, which is a leftover from the Level 1 consequence modeler. The Method needs to be modified to make the POI more dependent on the fluid's flash temperature as indicated in the SPFE Handbook of Fire Protection Engineering. Develop an equation for inclusion in 581 to determine the POI as a function of the flash temperature.

- 2008-018 - References for Alloy 400 susceptibility to HSC_HF

  In API 581, references are made to Alloy 400 susceptibility to HSC-HF stress corrosion cracking. However, the methodology for calculating susceptibility for Alloy 400, has not been included. This item will develop the methodology and provide the necessary changes to the calculation procedure and the flowcharts in API 581.

List of Potential Bidders

ABS Consulting
Contact: Steve Arendt
1-865-671-5812 |
or
16855 Northchase Dr
Houston, TX 77060
(281) 673-2800
(281) 877-6800

Det Norske Veritas (USA) Inc
1400 Ravello Drive
Katy, TX 77449

The Equity Engineering Group
2625 Bay Area Boulevard, Suite 325
Houston, TX 77058

The Hendrix Group, Inc.
15823 N. Barkers Landing
Houston, Texas 77079

Lloyd's Register Capstone
1505 Highway 6 South, Suite 250
Houston, Texas 77077

SGS Industrial Services
Competence Centre AIM
406 West US Highway 60
Bartlesville, OK 74005

Insulated & Uninsulated Stainless Steel Priority Ranking

Property Weighting	Property Description	Notes
LIKELIHOOD ITEMS		
1. Insulation Material		
0	Uninsulated	
1	Expanded foam glass / Urethane	
2	Perlite / Blankets	
5	Calcium Silicate / asbestos	
6	Mineral wool	
2. Temperature		
1	< 120 F	
2	> 300 F	
3	120-140F or 200 - 300 F	
4	140 - 200 F	
3. Environment		
0	Arid	
1	Temperate	
4	Marine: Deluge System/Wet Envir	
6	Severe: Cooling Tower Drift / Chlor-alkali / Acetic Acid	
4. Age of Coating		
1	0-7 years	
2	>7 -14 years	
3	>14 -21 years	
4	>21 years	
5	No Coating system	
5. Insulation Condition & Design		
0	Uninsulated	
1	100% metal jacket, minor integrity problems, no sign of wet insulation	
3	Moderate amount of jacketing integrity problems, and/or mastic head in good condition, damaged sealant	
4	Mastic head and/or corroded jacket. Signs of wet insulation, exposed terminations	
6. Thickness		
1	>0.250" thickness	
3	≤0.250" thickness	
7. Cycles Through 120-350F, 12+ cycles/yr		
0	No	
3	Yes	
8. Steam Tracing		
0	No	
3	Yes	
9. Lap Joint Flanges in Vertical Run		This will need definitions in the ESCC guideline to clarify flanges in vertical runs with the flange face facing downward (lap joint working as a cup).
0	No	
1	Yes	

Property Weighting	Property Description	Notes
CONSEQUENCE ITEMS		
10. Leak Consequence		
0	Others	
1	VOC / HRVOC	
5	Highly Toxic	50 ppm or less
11. Complexity to Replace		
0 2 5	Piping Small Vessel Large Vessel / Column / Reactor	
12. % Difference - Normal Operation vs. RV Set Pressure		Only applies to Equipment and Piping above 12" diameter, otherwise, "0" points applied. Add new field in Meridium at the Equipment Level.
0	PSV set pressure < 2 times normal operating	
5	PSV set pressure > 2 times normal operating	

The thought process is that most cases that involve excess pressure cycles (below RV set pressures) will involve low pressure 150 # flange systems, which have a flange rating (weak link) at a max of approx 270-285 psi depending on material, and 12" Std weight CS pipe is rated at a max of 788 psig and 12" Sch 10 SS piping is rated at ~450 psi for corresponding temperatures.

Property Weighting	Property Description	Notes
INSPECTION INTERVAL MODIFIER		
13. ESCC Inspection History		Can **NOT** use similar service data.
150%	Previous ESCC insp with no findings	
100%	No previous ESCC inspection	
75%	Previous ESCC inspection with Minor findings	
50%	Previous ESCC inspection with significant findings	

Attachment #2 Prioritization Matrix

		Consequence Category Sum of Items #10 - 12		
		< 3	**3 - 4**	**> 4**
Likelihood Category Sum of Items #1 - 9	**> 22**	Priority 4 Inspection Not Required	Priority 2 Inspection Interval = YY years	Priority 1 Inspection Interval = XX years
	11 - 22	Priority 4 Inspection Not Required	Priority 3 Inspection Interval = ZZ years	Priority 2 Inspection Interval = YY years
	< 11	Priority 4 Inspection Not Required	Priority 4 Inspection Not Required	Priority 3 Inspection Interval = ZZ years

A quality ESCC inspection will include inspection of 10-20% of the worse suspect areas (not necessarily easiest accessible). If there are any findings, the suspect area inspection is increased an additional 10-20% until no further defects are indentified or a 100% surface area inspection is performed. The ESCC guideline needs to provide guidance on what is defined as a suspect area (downstream of H2O entry points, not necessarily area that holds water).

Attachment #2 BLOBP2Count

Likelihood Category Sum of Items #1 - 9	209 Total	Consequence Category Sum of Items #10 - 12 < 3	3 - 4	> 4
	> 22	30	1	10
	11 - 22	94	25	43
	< 11	2	2	2

209 items

Priority 1	5%
Priority 2	21%
Priority 3	13%
None	61%
None	

69% of non insulated equipment/piping does not require inspection, most of the items that must be inspected are in the susceptible range, marine envir, and not coated

No uninsulated piping will require an inspection.

858 Total	Consequence Category Sum of Items #10 - 12		
Likelihood Category Sum of Items #1 - 9	**< 3**	**3 - 4**	**> 4**
> 22	226	0	90
11 - 22	156	1	384
< 11	1	0	0

858 Items	
Priority 1	10%
Priority 2	45%
Priority 3	0%
None	45%

31% of non insulated equipment/piping does not require inspection, of the 187 w/o insulation 128 have the greater than 2X PSV operating case, which drives an inspection being requried.

No uninsulated piping will require an inspection

2/2009 - UPDATED PIPING DATA:

416 Piping (ONLY) items - updated 3/11/09	
Priority 1	5%
Priority 2	4%
Priority 3	0%
None	80%

Likelihood Category Sum of Items #1 - 9 (793 Total)	Consequence Category Sum of Items #10 - 12: < 3	3 - 4	> 4
> 22	283	0	191
11 - 22	177	2	140
< 11	0	0	0

793 items	
Priority 1	24%
Priority 2	18%
Priority 3	0%
None	58%

52% of non insulated equipment/piping does not require inspection, of the 143 w/o insulation 115 have the greater than 2X PSV operating case, and 62 are "complex" to replace, which drives an inspection being requried.

Of 194 uninsulated piping circuits, 39 will require an inspection, mainly due to almost all having lap joint flanges, and approx half having RV vs set pressure higher than 2.

External Stress Corrosion Cracking (ESCC) in RBI

Technical Basis:

Scope: Applies to all Stainless Steel equipment and piping.

Purpose: This basis provides an approach to manage ESCC inspections of stainless steel equipment. It will allow focusing on the high consequence items that must be inspected / mitigated to avoid large process safety events or lengthy plant outages. It will allow the ESCC inspections to be integrated appropriately into the CUI program.

Background: The existing SCC modules in API RBI are not very useful for inspection management. The common complaint is that items are either always due for inspection or never due. The major goal is to establish a risk based approach that is based on realistic consequences. A related goal is to allow ESCC to be integrated into the CUI program.

Risk Factors: Risk is a combination of likelihood and consequence. The Likelihood and Consequence factors are listed below. The factors are listed below as they appear in the tool along with any additional instructions to apply them (if needed).

Probability of Failure Items

1. Insulation Material – Chose an insulation material. The insulation material definitions are as follows:
   a. 0 points = Uninsulated
   b. 1 point = Expanded Foam Glass / Urethane (or Al wrapped under insulation – European sites)
   c. 2 points = Perlite / Blankets
   d. 5 points = Calcium Silicate / Asbestos
   e. 6 points = Mineral Wool

   Explanation: - The incidence rate for ESCC is very low for uninsulated piping and equipment. History and our company experience has shown that mineral wool and calcium silicate (insulations that wick and hold water) are much worse than closed cell insulations such as sealed perlite and foam glass. Properly applied aluminium foil which is installed by insulation crafts has proven to be very effective at reducing ESCC.

2. Temperature – Specify the operating temperature. This data should be reviewed, and if different modes of operation are typical, the scenario yielding the greatest point value (most conservative) should be used. The temperature definitions are as follows:
   a. 1 point = <120 F
   b. 2 points = >300 F
   c. 3 points = 120-140 F and 200-300 F
   d. 4 points = 140-200 F

   Explanation: - Certain temperature ranges have proven to be more severe for CUI & ESCC. Longer exposures to liquid water tend to be worse for both mechanisms, but ESCC can occur with much shorter exposures to wet conditions. There are differences at the low end and the high end of the operative temperature range. Below 120 F significant CUI can occur, but ESCC is much less common. At the high end, our company sees no CUI above 250 F. Conversely, we have suffered many ESCC failures at 280 F and several above 300 F.

3. Environment – The environment definitions are as follows:
    a. 0 points = Arid
    b. 1 point = Temperate
    c. 4 points = Marine (includes Deluge System and Wet Environment areas)
    d. 6 points = Severe (includes Cooling Tower Drift, Chlor-alkali, and Acetic Acid areas)

    Explanation: - The environment ratings reflect the notion that more water exposure (higher rainfalls, cooling tower mist, deluge water testing, etc) is worse, and more chlorides from the environment are worse. We rate our Mid-western plants as Temperate and our Gulf Coast plants as Marine.

4. Age of Coating – Specify the age of the coating. The age of coating definitions are as follows:
    a. 1 point = 0-7 years
    b. 2 points = >7-14 years
    c. 3 points = >14-21 years
    d. 4 points = >21 years
    e. 5 points = No coating system

    Explanation: - Better coatings will greatly reduce the incidence rate of ESCC

5. Insulation Condition and Design –Specify the insulation condition and design definitions based on an external visual inspection. Values are as follows:
    a. 0 point = Uninsulated
    b. 1 point = 100% metal jacket, minor integrity problems, no sign of wet insulation
    c. 3 points = Moderate amount of jacketing integrity problems, and/or mastic head in good condition, damaged sealant
    d. 4 points = Mastic head and/or corroded jacket. Signs of wet insulation, exposed terminations

    Explanation: - Better insulation jacketing will let less water in.

6. Thickness – This item is the nominal thickness. The thickness definitions are as follows:
    a. 1 point = >0.250" Nominal Thickness
    b. 3 points= ≤0.250" Nominal Thickness

    Explanation: - Industry and company experience have shown that thinner components are more likely to fail.

7. Cycles Through 120-350°F (49-177°C), 12+ cycles/year - This item measures if the equipment cycles through the range of 120-350°F (49-177°C), 12+ Cycles/year. The cycles through 120-350 °F (49-177°C), 12+ cycles/year definitions are as follows:
    a. 0 points = No

b. 3 points = Yes

Explanation: - Company experience has shown that cycling though the hot water temperature range is a significant severity factor.

8. Steam Tracing – The Steam Tracing definitions are as follows, note that electric tracing = No
   a. 0 points = No
   b. 3 points = Yes

   Explanation: - Steam tracing leaks supply the water and the temperature for ESCC to occur.

9. Lap Joint Flanges in Vertical Run – This item only applies to lap joint flanges which are in vertical runs where the lap joint flange face is facing downward. In this orientation the lap joint flange forms a cup. The Lap Joint Flanges in Vertical Run definitions are as follows:
   a. 0 points = No
   b. 1 point = Yes

   Explanation: - The failure rate from ESCC on this configuration exceeds 50% over time. The failure rate on lap joint flanges with flange face is very low. Other orientations of lap joint flanges have not been a problem.

Consequence of Failure Items

In our opinion, the consequence factors for ESCC are very different than for carbon steel. Accordingly they deserve a more thorough description. Three consequence characteristics have been developed.

10. Leak Consequence –The Leak Consequence definitions are as follows:
    a. 0 points = Others
    b. 1 point = VOC / HRVOC (Highly Reactive Volatile Organic Compounds)
    c. 5 points = Highly Toxic (per LBI definition below)

    Highly Toxic Definition: Any fluid that contains a substance with an ERPG-3 of 50 ppm or less at a concentration greater than 1 wt.% for liquids and 1 mol.% for vapors (ERPG is the AIHA Emergency Response Planning Guide).

Explanation: - The vast majority of ESCC events result in no leak or a very small leak. Accordingly a fire event is very unlikely. For VOC or HRVOC, the common potential is for a fugitive emission situation. The only conceivable high consequence event would be a fatality from a small leak of a highly toxic material. (See below for a definition of ERPG-3 (ratings)).

11. Complexity to Replace –The Complexity to Replace definitions are as follows:
    a. 0 points = Piping
    b. 2 points = Small Vessel
    c. 5 points = Large Vessel / Column / Reactor

Explanation: - We know of 2 persuasive examples where lack of an ESCC inspection program led to extended outages and expensive expedited equipment replacement. Company

External Stress Corrosion Cracking (ESCC) in RBI

X suffered a 6 month outage when ESCC leaks prompted a more thorough inspection. ESCC was so extensive that the column was condemned. Company Y suffered a lengthy outage to replace their solid stainless steel reactors in a European facility when extensive ESCC cracking was discovered after not looking for 30 years. LBI legacy companies have been 100% successful at allowing continued operation when ESCC is found by proactive inspection. A multi-month outage to replace a major piece of equipment that idles an entire unit is a high consequence event.

12. RV Set Pressure Well Above Operating Pressure – This field only applies to Equipment and Piping above 12" diameter, otherwise the field point value is "0". The % Difference definitions are as follows:
    a. 0 points = PSV set pressure < 2 times normal operating
    b. 5 points = PSV set pressure > 2 times normal operating

    Explanation - This consequence factor is a proxy for rupture potential. At a company facility, a small SS drum became plugged. The drum had 150# flanges on it; so the operator hooked up 150# steam to try and blow out the plug. Instead he blew the bottom head off the drum. ESCC cracks had formed at low operating pressure. When higher pressure was applied, the remaining load carrying area was exceeded. The proxy for this item is an RV set pressure greater than 2X the normal operating pressure.

Inspection Interval Modifier

11. ESCC Inspection History – Similar service data can NOT be applied to this field. The inspection history must be from the actual piece of equipment / piping. The percent values given by this field are multiplied by the base inspection interval from the ESCC prioritization matrix to obtain the actual inspection interval. The ESCC Inspection History definitions are as follows:
    a. 150% = Previous ESCC inspection with no findings
    b. 100% = No previous ESCC inspection
    c. 75% = Previous ESCC inspection with Minor findings
    d. 50% = Previous ESCC inspection with Significant findings

Inspection Quality Descriptions

A quality ESCC inspection will include inspection of 10-20% of the worse suspect areas (not necessarily easiest accessible). If there are any findings, the suspect area inspection is increased an additional 10-20% until no further defects are indentified or a 100% surface area inspection is performed.

Guidance needs to be provided on what is defined as a suspect area (downstream of H2O entry points, not necessarily area that holds water).

Risk Matrix

The risk matrix for ESCC is given below.

External Stress Corrosion Cracking (ESCC) in RBI

Likelihood Category Sum of Items #1 - 9	Consequence Category Sum of Items #10 - 12: < 3	3 - 4	> 4
> 22	Priority 4 Inspection Not Required	Priority 2 Inspection Interval = YY years	Priority 1 Inspection Interval = XX years
11 - 22	Priority 4 Inspection Not Required	Priority 3 Inspection Interval = ZZ years	Priority 2 Inspection Interval = YY years
< 11	Priority 4 Inspection Not Required	Priority 4 Inspection Not Required	Priority 3 Inspection Interval = ZZ years

The matrix above will help to drive inspections on high risk situations. Hopefully it will change the company's conventional wisdom that all ESCC events are low consequence.

NOTE: This could be converted to ISO risk with some effort.

Many large pieces of equipment will be immediately over due.

Most piping systems will not require external inspection.

ERPG-3 is the maximum concentration in air below which it is believed nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.

Reference for ERPG-3
http://chemresponsetool.noaa.gov/loc_guide/erpg.htm

581 Item Number	Part Title	Section	Description	581 Group Comment	Priority	Effort	Technical Ranking	Assigned to	Date	STATUS Update	Part of RSF Work
2008-001	Probability of Failure	Equation 12	Equation 12 – Future work is needed to correct errors with thick walled vessels.	No work around other than artificially increase corrosion rate. Add caution note to 581 document for this 2nd edition publication. **RSF work**	High	easy	126	Lynne Kaley, Phil Henry	prior to 2nd ed publication	No progress, this item will be covered as part of RSF work.	Yes
2008-002	Probability of Failure	18.0 and 19.0	In small bore piping, CUI is typically generalized; therefore if thinning was localized and you took only the max damage factor, the total damage factor would not reflect both mechanisms.	User or logic would be needed to tag field that CUI is generalized vs localized. Modify text to external module in 581. Probabilistic approach may change how this is done	High	Easy	126	Allison Hardy	10/28/2008	**2009-04:See ballot 2008-002. RSF methodology will correct. Ballot is not required**	
2008-003	Probability of Failure	16 / 17	Change Pipe support penalty F sub PS to a Design Penalty to allow the use for other equipment types (e.g. vessel stiffener rings, insulation support rings) where a "poor" design detail allows water to pool.	Ready for balloting	High	easy	126	Ken Gottselig	27-Oct-08	**2009-04: See ballot 2008-003**	
2008-004	Heat Exchanger Bundle	Table 8.6	Need to develop the inspection effectiveness table for all damage mechanisms.	Not covered as this is bundles. Do not have anything for bundles. Not in 2nd edition	high	low	84	Greg Alvarado - Lead John Britton, Lisa Roberts, Al Montero, Mark Geisenhoff	12/31/2008	**2009 Budget Dollars** **2009-04-15 John Britton:** In the bundle ballot 581-10-05 (from 2005?) there was some basic Inspection effectiveness' given in Table S-9 as Modification factors for Inspection Effectiveness. The were: Highly Effective (A) - 20% - 100% Eddy Current / IRIS inspection Usually Effective (B) - 10% - 20% Eddy Current / IRIS inspection Fairly effective (C) - - Visual Inspection Ineffective (E) - No Inspection This could be a good starting point for this item. Need to add some meat to this as well as a "D" effectiveness	
2008-005	Probability of Failure	Table 10.1	Table 10.1 lists the steel product form (plate or pipe) as required data for HIC/SOHIC – H2S and HIC/SOHIC – HF. However, this data is not used in either the look-up tables for the severity index or the determination of the damage factor in the flowchart in Figure 10.1. Determine if the steel product form will have an effect on the calculations and decide if it is required data.	Need to review / revisit and recommend changes	High	low	84	Lynne Kaley, John Britton		**2009 Budget Dollars** **2009-04-15 John Britton:** The software currently does not distinguish between plate and pipe material of construction for calculation of susceptibility to HIC-SOHIC (H2S or HF). API mentions it as a factor in Table 10.1 but does not use it in calculations. I believe that it should be re-introduced into API 581 REV 1 in a similar fashion as it was in Rev 0. With pipe products having a LOW susceptibility unless it is in "severe service" and no PWHT - in which case it is a MEDIUM susceptibility.	
2008-006	Consequence of Failure	6.8.1.4	The methodology assigns probabilities to whether a flash fire or VCE occur without giving much emphasis on the phenomena. It is recommended to consider the presence of congestion/confinement in the vicinity since they would be the major source of increasing the flame speed.	VCE or flash does need to consider release location. Can make as a function of congestion. Go to a TNO energy method rather than TNT. Tie into facility siting studies. We are conservative near the explosion	High	low	84	Phil Henry, John Britton, others		**2009 Budget Dollars** **2009-04-20 John Britton:** I am not a consequence expert, but would appear that putting into the calculation a few subjective variables such as "location" (ground level, elevated, pipe rack, near ignition source, etc), congestion (either a % value or possibly a high, medium, low) would be a good addition. Should provide explanation of variables and default values.	

581 Item Number	Part Title	Section	Description	581 Group Comment	Priority	Effort	Technical Ranking	Assigned to	Date	STATUS Update	Part of RSF Work
2008-007	Consequence of Failure	6.8.1.2	Qualitative studies by Lees (1986) have shown that ignition probability increases as the size of the release increases. The values for the probability of ignition employed in the Level 2 event trees are a significant improvement over Level 1 and are consistent with current research. For example, the Energy Institute in the United Kingdom has performed extensive research on ignition probabilities and has published a number of reports on this topic. One report, Ignition Probability Review, Model Development and Look-up Correlations, relates ignition probability to the mass release rate. The following figure shows how curves from their research are similar to the work of Cox, Lee, and Ang cited in Section 6.8.1.2.	Event tree probability tables the prob of ignition goes up as lighter molecular weight. Make this a function of flash point (lower flash point) instead of density. Level 2 only.	High	low	84	Phil Henry, Les Loushin, Greg Holton (outside consultant- need funding), Steve Bolinger		**2009 Budget Dollars** **2009-04-20 Allison Hardy:** Event tree probability tables the prob of ignition goes up as lighter molecular weight. Make this a function of flash point (lower flash point) instead of density. Level 2 only.	
2008-008	Consequence of Failure	5.8.2.3.b	Need to verify level 1 overpressure limit for personnel.	Limit on person is 5 psi explosion overpressure, this is very high, same as equipment. Lynne to check old training material (blast overpressure). Using 3psi in Level 2, 5 psi in Level 1 for both personnel and equipment. Lynne to call Bernie Weber.	High	low	84	Lynne Kaley		**2009-03-12.** Information has been found (see PPT file from DNV). Limit on overpressure in API is 5 psig for both equipment and personnel. **2009-04-15 Lynne Kaley** Equipment Damage Criteria: • Explosion overpressure: 5 psig • Thermal Radiation: 12,000 BTU/hr-ft 2 for fireball, jet fire and pool fire • Flash Fire: 25% of area within the LFL of the cloud when ignited Personnel Serious Injury Criteria: • Explosion overpressure: 5 psig • Thermal Radiation: 4,000 BTU/hr-ft 2 for fireball, jet fire and pool fire • Flash Fire: LFL limits of the cloud when ignited **2009-04-22 Phil Henry:** Add to Status the following: The 2nd edition, paragraph 5.8.2.3 needs to be modified since it incorrectly shows that the Level 1 consequence area tables were based on 3 psig overpressure	
2008-009	Probability of Failure	18.0 and 19.0	A measure wall loss based on a thinning inspection should only be applied to the ar/t calculation for thinning and not external. Lyondell has recommended a methodology to do this.	It was agreed upon in past meetings not to change until RSF approval is implemented. This is a warning in the text. RSF Work	High	low	84	Phil Henry		No progress.	Yes
2008-010	Probability of Failure	15.6.3	Wording in 15.6.3 notes that the susceptibility changes with respect to the product form for HIC/SOHIC – HF. However, this logic is not built into either the look-up tables for the severity index nor the flowchart to determine damage factor. Determine whether product form will affect the calculations and determine if it is required data.	Need to review / revisit and recommend changes. Same as item 2008-005. Combine with this item 2008-005	High	low	84	Lynne Kaley		**2009 Budget Dollars**	
2008-011	Consequence of Failure		Handle liquid volume fractions appropriately for release	results in order of magnitude differences in consequence areas. This is being worked as of Feb 2008.	high	low	84	Phil Henry		No progress **2009-04 Get better description for scope**	
2008-012	Consequence of Failure	Table 5.17	Review/revise the outage days in Table 5.17. Many seem quite low. Should be conservative.	Add editorial note to table 5.17. Phil to add to 2nd edition. Second item to review the table	Medium	Easy	72	Jon Britton, Ken Gottselig, Lynne Kaley		Note was added to table 5.17 in the 2nd edition. Need revision to table. **2009-04-15 John Britton**: No progress **2009-04: Committee to solicit input and feed back.**	

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2008-013	Probability of Failure	Annex B.B13	Annex B, paragraph B13 does not show any bibliographic references. Also, no mention of organic acid which are fundamental in CO2 corrosion.	True, needs to have references added	Medium	Easy	72	Jon Britton		**2009-04-15 John Britton:** For a reference for CO2 corrosion. the module used data data taken directly from NORSOK - M-506. According to Eydstein the module in API is just a simplified version of M-506. Adding some text in 581 mentioning the carbonic acid could be inserted fairly easily.	
2008-014	Consequence of Failure	A.3.6.7	The consequence areas for ammonia are based upon aqueous or anhydrous ammonia - not clear - needs to be clearly stated.	Review and revise.	Medium	Easy	72	Phil Henry		No progress. 2009-04 probably ahnydrous- need to confirm	
2008-015	Heat Exchanger Bundle	8.6.5	Bundle life extension should be added to the remaining bundle life, not to the past bundle life. This could be tied into the ERL approach of 8.6.4.3.3.	valid comment. Need to do it the way as proposed	Medium	low	48	Phil Henry, Ken Gottselig		No progress	
2008-016	Heat Exchanger Bundle	8.5.2	Need to adjust the risk matrix x and y values to make more consistant with other module of API RBI.	review risk matrix for all equipment types (iso risk format). This is a reporting issue if we agree with Iso risk format. 2008_11: We should add this as an alternate method rather than delete the existing method.	Medium	Low	48	Allison Hardy, Boyd McKay (2008_11)		Boyd McKay to revise the existing 2008-016 item.	
2008-017	Consequence of Failure	5.8.1	A variety of models have been developed to represent the physics of the atmosphere, and there are a number of commercially available models, including SLAB, that evaluate the source term conditions and determine if the release is dense or passive. Based on these passive versus dense calculations, these models then use the appropriate equation to model the release to predict consequence areas. Currently, the API RBI software only uses dense calculations. A passive or neutrally buoyant modeler should be added.	Modeler is a dense gas, lighter gases will move up. We have overly conservative results for light gases such as H2 and methane.	Medium	low	48	Phil Henry, Greg Holton		**2009-04 Update:** **2010 potential Budget Dollars**	
2008-018	Probability of Failure	14	References are made in 14.2 to Alloy 400 susceptibility but neither BRD nor the software has any methodology for calculating susceptibility, reference provided in 14.8, needs to be included	Find the lost references and logic/flowchart. This is included in 571 but not in 581	Medium	Low	48	Lynne Kaley		**2009 Budget Dollars**	
2008-019	Consequence of Failure	7.8	For ASTs, see 7.8, Shouldn't we be modeling flammable and explosives, toxic for a shell leak?	ASTs only model tank floor. Committee to decide on how to handle shell leaks. Yes we should be modeling. See focus group action list 2009-04: document only looks at	Medium	low	48	Steve Wickerson, Steve Bolinger, Jon Britton			
2008-020	Consequence of Failure	5.5	In 5.5, all liquid releases should be modeled as a continuous release regardless of the quantity or the duration of release. In such cases, a puddle or pool will be formed, and, depending on the make-up and temperature of the liquid release, evaporation over an extended period of time will occur. Selection of pool size and depth will depend on the quantity of liquid released.	10000 lb or 3 minutes is not applicable to liquids, could do for both level 1 and 2. Need more info from GH. Phil to find out more	Medium	low	48	Phil Henry		No progress	
2008-021	Heat Exchanger Bundle	Table 8.1	Scale build up. Can this be differentiated from fouling and be treated separatedly? Treat scaling as a key attribute	needs to be worked. Proposed filtering item only.	low	easy	18				

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2008-022	Probability of Failure	B.6	According to the H2O / HF module the corrosion rate for carbon steel is the same for HF in water conc. >= 80% and for anhydrous hydrofluoric acid. This doesn't appear to be right according to NACE paper 04645. This situation doesn't seem to comply with practical situations verified in HF units. In my opinion it's difficult to trust this module to give a good corrosion rate prediction but I'm not an expert in this corrosion mechanism.	Need to review Table B.34. Jon Dobis to check	Medium	Medium	16	Jon Dobis			
2008-023	Probability of Failure	8.2, Figure 8.1	API RP 571 states that cracking is most prevalent in MEA and DEA systems, not MEA and DIPA. It then states that DIPA performs better than MEA and DEA, but not as well as MDEA. Paragraph 8.2 and Figure 8.1 needs to match API 571.	Task group to look at NACE and 571 documents and recommend changes	Medium	Medium	16				
2008-024	Consequence of Failure	5.8.5	As discussed in 5.8.5, the values for the consequence area reduction factors employed in Table 5.10 seem arbitrary and need supporting references to evaluations and tests of mitigation measures in process unit environments.	Comment valid. – need better numbers with supporting references. Require a 3rd party to develop. Phil to ask Greg Holton to give estimate of cost to develop	Medium	Medium	16	Phil Henry		No progress	
2008-025	Consequence of Failure	5.8.5	Adjustment of consequence areas to account for energy efficiency is appropriate and important. For example, Lees in Loss Prevention in the Process Industries has found that the energy efficiency in most explosions has been small, with approximately 2% of the combustion energy being converted into a blast wave. Unlike the Level 1 methodology, however, Lees makes no distinction between instantaneous and continuous sources. Clearly, employment of some form of adjustment like Equation 17 is necessary and appropriate, but no distinction between instantaneous and continuous sources should be made, and references to actual historical releases should be provided to support the parameter values in the equation.	Comment is valid, for Level 2. Additional work including references is needed. Require a 3rd party to develop. Phil to ask Greg Holton to give estimate of cost to develop	Medium	Medium	16	Phil Henry		No progress	

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2008-026	Probability of Failure	16.6.3 and 17.6.3	In the approved external ballot, the date was modified based on the coating condition at the time of inspection. "A" effectiveness Date=Inspection Date + 5 years "B" effectiveness Date=Inspection Date + 2 years . This is not in the final 2nd edition publication. Here is what is in approved last ballot Table N-6 – External Corrosion Adjustments for Coatings Quality **New Coating Quality** None Medium High Date = Date Installed Date = Coating Date + 5 Date = Coating Date + 15 **Existing Coating Quality at Inspection Date** None Medium High Date = Inspection Date Date = Inspection Date + 5 years, for an "A" level inspection*. Date = Inspection Date + 2 years for a "B" level inspection*. *(Only if the coating was found intact upon inspection) Not used.		Medium	Medium	16				
2008-027	Consequence of Failure	5.5	In 5.5, vapor releases that extend beyond one minute should be modeled using continuous models. Treating vapor releases in the manner described above has several advantages. First, many vapor releases are characterized by a very large initial release (such as when a pressure relief valve opens) followed by a longer, lower rate, more steady-state release. Modeling the initial release as a puff and the follow-on release as a plume produces defendable results. Second, lumping an entire three-minute release into one puff may produce misleading results. In such a case, too much emphasis may be placed on a particular accident sequence because it produces a very undesirable and unacceptable consequence outcome (like a vapor cloud explosion) when such an outcome is actually not possible if its release conditions are properly modeled.	Probably technically correct, we will not change level 1. Investigate this for level 2.	Medium	Medium	16			No progress	
2008-028	Heat Exchanger Bundle	3.1	Include the definition and work book for Qualitative Risk Analysis from the original edition of the base resource document (Appendix A) to offer the option for a simplified method to quickly prioritize units, major portions of units or systems for further risk analysis.	Open action item. There is little technical basis for current work book. This is for all modules. Scott to look at providing a simple quantitive procedure to group to review	Medium	Medium	16				
2008-029	Probability of Failure	General	Need to revisit the inspection effectiveness table	Revisit	High	High	14				

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2008-030	Probability of Failure	General	As a general comment from a LNG gas producer, the determination of corrosion rate in Annex B is almost exclusively dedicated to refining industry, with very few item dealing with upstream. Only chapter which could be considered as relevant is chapter B13 CO2 Corrosion. No mention of corrosion rate when we have CO2 and H2S together. We are working on Gas Plant wrapper.	581 committee to look at upstream concerns and address. Are there other upstream concerns? Additional damage mechanisms. Look for sub group of upstream companies to work on this issue.	high	High	14	John O'Brien (SCI chair)	4/20/2009	**2008_11**: should this group handle upstream RBI. SCI chair to discuss with CRE and Upstream group. **2009-04-15 Lynne Kaley**: This is not my action but we have been working with several upstream companies and applying the API 581 methodology. There is a task group within the API RBI User Group that is developing a list of comments and recommended modifications for use in upstream applications. The group is also keeping Roland Goodman and the API Upstream standards committees updated as development continues. The recommendations will be documented and presented to both the API RBI User Group and API 581 committee when their work is complete. **2009-04-10 John O'Brien** - See Email in minutes April 2009	
2008-031	Probability of Failure	B.7	Under deposit corrosion resulting from ammonium bisulfide salt (NH4HS) sublimation and consequent accumulation is not considered; This is a very important corrosion issue.	Review module and revise as appropriate. A new module may be required.	High	High	14	M. Cayard (FHR)	11/7/2008	We do not believe that a module is appropriate for under deposit corrosion for either ammonium bisulfide salt or ammonium chloride (NH4Cl) salt. The formation of these deposits should be avoided. **This item is closed**	
2008-032	Probability of Failure	B.2	Under deposit corrosion caused by ammonium chloride (NH4Cl) salts is not treated in this module. This is a very important corrosion issue and should be reviewed.	Review module and revise as appropriate. A new module may be required	High	High	14	M. Cayard (FHR)	11/7/2008	We do not believe that a module is appropriate for under deposit corrosion for either ammonium bisulfide salt or ammonium chloride (NH4Cl) salt. The formation of these deposits should be avoided. **This item is closed**	
2008-033	Consequence of Failure	6.8.1.3	Qualitative studies by Lees (1986) have shown that ignition probability increases as the size of the release increases. The values for the probability of ignition employed in the Level 2 event trees are a significant improvement over Level 1 and are consistent with current research. For example, the Energy Institute in the United Kingdom has performed extensive research on ignition probabilities and has published a number of reports on this topic. One report, Ignition Probability Review, Model Development and Look-up Correlations, relates ignition probability to the mass release rate. The following figure shows how curves from their research are similar to the work of Cox, Lee, and Ang cited in Section 6.8.1.2.	Further work is needed on event tree probabilities, E2G will take this as an action item for future revisions. A 3rd party may be required to develop after some further research	High	High	14	Phil Henry		**2009-04-22 Phil Henry** : E2G is currently performing rigorous comparisons between the Level 1 and Level 2 consequence modelers, spurred on by recent efforts of Allison Hardy. In general, the Level 2 modeler will result in higher consequence areas. The main difference appears to be the calculation of the event tree probability of ignition which increase significantly as a result of release rate. A summary of these results is planned to be presented at the User's Group meeting in June.	

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2008-034	Consequence of Failure	6.8.1.2	Qualitative studies by Lees (1986) have shown that ignition probability increases as the size of the release increases. The values for the probability of ignition employed in the Level 2 event trees are a significant improvement over Level 1 and are consistent with current research. For example, the Energy Institute in the United Kingdom has performed extensive research on ignition probabilities and has published a number of reports on this topic. One report, Ignition Probability Review, Model Development and Look-up Correlations, relates ignition probability to the mass release rate. The following figure shows how curves from their research are similar to the work of Cox, Lee, and Ang cited in Section 6.8.1.2.	Further work is needed on event tree probabilities, E2G will take this as an action item for future revisions. A 3rd party may be required to develop after some further research	High	High	14	Phil Henry		**2009-04-22 Phil Henry:** E2G is currently performing rigorous comparisons between the Level 1 and Level 2 consequence modelers, spurred on by recent efforts of Allison Hardy. In general, the Level 2 modeler will result in higher consequence areas. The main difference appears to be the calculation of the event tree probability of ignition which increase significantly as a result of release rate. A summary of these results is planned to be presented at the User's Group meeting in June.	
2008-035	Probability of Failure	5.0 and 6.0	How do we address SCC mechanisms on cladding where this could result in exposing the base material to the environment before the corrosion mechanism would indicate.	SCC on cladding has not been considered. Need to develop methodology to address	High	High	14				
2008-036	Probability of Failure		Implement the RSF for thinning and cracking	currently being worked. Late 2009 for evaluation of this method	High	High	14			**2009-04-20 Ken Gottselig:** Prototype is scheduled for end of year 2009, Limit states equations for general and local thinning are developed. Difficult part will be to account for inspection effectiveness.	Yes
2008-037	Probability of Failure		Revise sour water module to reflect JIP public domain documents	Items B.2 and B.7 will be absorbed into this item	High	High	14	M. Cayard (FHR)	11/7/2008	See attached proposed rewrite in email to Ken 11-7-08	
2008-038	Probability of Failure	Table 6.1,	Add Fiberglass Liners (Tanks) to Table 6.1 & 6.2	Require modification to table 6.1, 6.2 and 6.5	Low	low	12				
2008-039	Heat Exchanger Bundle	8.7.2	This section is unclear on how to use the data to make the "inspect versus replace" decision. What if both are less that the ECOF?? Both greater??	valid comment, needs to be cleaned up.	low	low	12	Phil Henry		No progress	
2008-040	Consequence of Failure	6.7.2	It is recommended that example calculations be provided that calculates the flash fraction of a representative fluid.	Create Level 2 example	low	low	12	Phil Henry		No progress	
2008-041	Heat Exchanger Bundle	8	Need to review the Additional Uncertainties used based on the level of inspection, do these need to align with fixed equipment??	No do not need to align to fixed equipment, but we do need to review.	low	low	12			No progress	
2008-042	Probability of Failure		Minimum probablity of failure threshold (residual risk).	Minor to add to 581. Make this user defined. This is for unispectable risk.	low	low	12				
2008-043	Probability of Failure		Intermittent service for CUI.	Life fractions / timeline needed to calcuate result	low	low	12				
2008-044	Probability of Failure	Table 4.1	It is not clear why tank shell wall GFFs are different than a pressure vessel wall. Add a note to explaining why the Tank course GFFs are different than the vessel/ finfan values OR decide whether or not to change to pressure vessel Gff.	Open action item. Consider RSF for Tank walls and floor	Medium	High	8				Yes

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2008-045	Probability of Failure	General	Review all of cracking mechanisms to determine how to give credit for internal linings.	Need group to address	Medium	High	8				
2008-046	Probability of Failure	5.6, Table 5.2	Need to include Furnace/ Heater as an equipment type	Creep module is on list of new / revised modules, will need to add furnace equipment type.	high	High	14			**2009-04: possible 2010 budget dollars**	
2008-047	Consequence of Failure	5.4.2	Allow for higher response time and change consequence accordingly. This effects the available mass for the release. Using a cutoff mass to determine the release type is not accurate.	There is a cutoff time for mitigation. It does seem arbitrary to use 3 minutes as the cutoff. Need 3rd party involvment to complete this. Both level 1 and level 2	Medium	High	8			No progress	
2008-048	Probability of Failure		Ability to add a tank roof as a component and also internal floating roofs	Lynne to forward priority. Concern about personnel exposure to thinning roofs. Environmental effect of holed through roof. Consider tank group at API	high	high	14			Joel Andreani and Phil Henry (both E2G) are working this.	
2008-049	Probability of Failure		HTHA module	Phil to check on HTHA module, 941 mods for cladding and weld overlay. Revise effort and difficulty when more data is obtained	Medium	High	8			**2009-04: possible 2010 budget dollars**	
2008-050	Probability of Failure	Table 8.6	Add life extension method for ferrules insertion	For ferrules, life extension factor of 0.5 max. Peer review of life extension table. May consider adding other items to table	low	Medium	4	Phil Henry		No progress	
2008-051	Heat Exchanger Bundle	Table 8.1	Can mitigation actions such as scale inhibitor also be included??	needs to be worked - (corrosion or bundle fouling?). Effort depends on solution	low	Medium	4				
2008-052	Probability of Failure	Table 6.1	Cement lining of sea water CS network to be added to Table 6.1.	Add cement lining to this section. Flowchart/ logic and table modifications. Sub-group to determine how to add it.	Low	Medium	4				
2008-053	Consequence of Failure	5.4.3	In 5.4.3, revise the calculation procedure to account for inventory reduction if the operator is successful in mitigating the release. If the operator is unsuccessful, assess the impact of the release using the inventory group mass.	Action item: We don't reduce the inventory based on success. We reduce the consequence area or amount of release. Good idea but low priority, could only do on Level 2 method. Can be done when item 5.4.2 is done.	Low	Medium	4			No progress	
2008-054	Consequence of Failure	5.4.2	In 5.4.2, for large leaks, recommend that a safety function be added to the event tree which accounts for operator intervention. The likelihood of success or failure should be determined from data on industrial accidents or plant operating history. The potential impacts of the release would then be calculated for both the inventory group mass and the reduced inventory.	Action Item: Open, based on mitigation or isolation, we adjust amount released. (Level 2). Low priority but it is right way to go.	Low	Medium	4			No progress	
2008-055	Probability of Failure		Thinning with dual operating conditions	Life fractions / timeline needed to calcuate result. Consider different operating conditions	low	Medium	4				

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2008-056	Probability of Failure	7.3	The screening criteria only focus on carbon and low-alloy steel. However, API RP 571 specifically states that 300 Series SS is susceptible to caustic cracking. The screening should include 300 Series SS.	task group needed to address this issue.	low	High	2				
2008-057	Probability of Failure		Boiler module	Antonio to present at next User Group meeting	low	High	2			**2009-04: possible 2010 budget dollars**	
2008-058	Probability of Failure	Tables 17.3 and 17.3M	Tables 17.3M and 17.3, The compromise values for severe service appear to be low by at least a factor of two. Observed CUI corrosion rates in coastal locations is a significant problem on the order of 40+ mpy. It doesn't appear that the module instructions would get to 40 with out someone sharing the information that I have brought to the table. Also, the worst temperature range has been observed to be between 180 and 250°F rather than 160 and 240°F.	The current module can predict corrosion rates of up to 80 mpy on "severe", 40 mpy on marine. **Agreed to accept as is and look for future improvements in CUI module**	high	easy	126	Allison Hardy	11/17/2008	**complete**	
2008-059	Probability of Failure	Equation 11, Table 5.11	Equation 11 does not go to Table 5.11 till remaining wall is less than Tmin + CA. This can be significant "damage" with no indication in software of a problem (no damage factor). Table 5.11 is still based on a % of total wall loss instead of a % of "acceptable" wall loss. Incorporate damage state probabilities for Trd and CR prior to going to an equation like equation 11. Rework equation 11 and table 5.11 so that a significant DF is observed when approaching Tmin.	It was agreed upon in past meetings not to change until RSF approval is implemented. RSF approach to be presented at next 581 meeting. Issue should go away with RSF. See RSF item for priority and ranking **Part of RSF work**	None	None	0				Yes
2008-060	Probability of Failure	7.6, 8.6	All SCC equations (ie Section 7.6 Equation 15, Section 8.6 Equation 16, etc) - Future work needs to be done on the equation. Inspection intervals are too conservative without inspection history and not conservative enough once an effective inspection history has been established.	RSF to handle cracking in addition to metal loss. Make sure limit state equation for cracking is added. **Part of RSF work**	None	None	0				Yes
2008-061	Probability of Failure		Carbonate Cracking - revision using alternative parameters	NACE paper presented by ExxonMobil. Paper # 07564.	High	Medium	28				
2008-062	Consequence of Failure		ASTs should be able to model the same fluids as other fixed equipment	would need procedure to address failure of tank roof. 620 also covers refrigerated tanks.	low	Medium	4				
2008-063			Add tanks designed to API 620		low	high	2				
2008-064			Add finfan header box	MAWP basis versus tmin	Medium	low	48	Phil Henry		No progress	
2008-065			review TWG actions - Hearl Mead's list	Aug 2005 last meeting of TWG. Lynne to forward to Ken.			0				
2008-066	2		calculate the probability of personal injury	regulatory requirements effect on risk targets.	Medium	Medium	16				

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2008-067			Example Manual - To aid in jurisdictional approval, examples should be provided to demonstrate the calculations. The examples are provided to illustrate the calculations used in the assessment procedures in API 581.	Develop case studies to demonstrate benefit (difference) vs traditional methods	high	high	14				
2008-068			Improve inspection planning procedure. Dave Osage to supply proposed procedure		high	high	14	Dave Osage		**2009-04: Require plan for Fall 2009 meeting.**	
2008-069			Add 0.5Cr-0.5Mo generic material (e.g. SA-387, SA 204 grade A) to table 20.3 in the HTHA section of Part 2.		Medium	Medium	16	Phil Henry		No progress	
2009-001			need to provide a definition/table explaining the available external environments possible for external damage module. These could be defined based on annual rain fall or something like that. · Marine · Temperate · Arid/Dry · Severe	The drivers for external corrosion. This can be the weather at a location (e.g. Marine), the potential for cooling tower drift, the use of sprinkler systems, or other contributors. Choices Include: Severe – sweating environments, operating temperature near dew point, cycling through dew point regularly, cooling water tower drift areas Marine – coastal locations, high annual rainfall and warmer climates Temperate – drier mid-continent locations Dry – Arid climates	high	easy	126				
2009-002		21	Brittle Fracture Module review and revise the brittle fracture module. Comparison with Failure data shows some failures occuring with low damage factors (low as 19). Module also should be able to handle assessment for brittle fracture at pressures other than MAWP, both higher and lower.		Medium	Medium	16	Ken Gottselig Lynne Kaley		No progress	
2009-003			Ethanol Stress Corrosion Cracking Develop technical basis for a risk based approach to assessing ethanol SCC	Recommend that this group await technical basis document from pipeline group or API Corrosion and Materials.	Medium	High	8			**2009-04: API group will be updating API 571 Section 4.5.7.**	
2009-004			New Module for ESCC.		high	Medium	28	Ken Gottselig		Presented at 2009 Spring Meeting	