PACIFIC GAS AND ELECTRIC COMPANY

GAS TRANSMISSION AND DISTRIBUTION
GAS ENGINEERING
GAS INTEGRITY MANAGEMENT AND TECHNICAL SUPPORT
Risk Management

Procedure for Risk Management

Procedure No. RMP-02
Rev. 5
External Corrosion Threat Algorithm

Prepared By: _____ Date: 11/21/01____

Approved By: _____ Date: 11/21/01____
, Lead Risk Management Engineer

Approved By: _____ Date: 11/26/01____
, Manager, System Integrity

Rev. No.	Date	Description	Prepared By	Approved By	Approved Manager, System Integrity
0	11/26/01	Initial Issue			
1	1/8/03	Revised as Shown			
2	6/13/05	Revised as shown-added section 5.0			
3	10/22/05	Revised as shown			
4	7/12/06	Revised as shown			
5	1/14/10	Revised as shown			

Position	Type of Training:	How Often
Integrity Management Program Manager	Procedure review of RMP-01 and RMP-02	• Upon initial assignment • Once each calendar year.
Steering Committee Chairman	Procedure review of RMP-01 and RMP-02	• Upon initial assignment • Once each calendar year. • As changes are made to the procedure.
Steering Committee Members (Subject Matter Experts)	Review RMP-02 and Steering Committee requirements of RMP-01	• Once each calendar year at the time of the steering committee meeting.
Risk Management Engineers	Review Procedure RMP-02	• Upon initial assignment • Once each calendar year. • As changes are made to the procedure.

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6.0 EC Threat Algorithm

6.1 Gas Transmission

Scoring for the External Corrosion (EC) threat algorithm shall be calculated per the direction of the EC Steering Committee. The committee has determined that the factors in A through M of this section are significant for determining the Likelihood of Failure (LOF) of a gas pipeline due to EC. The EC contribution to LOF shall be the summation of assigned points times the assigned weighting of the following factors:

A) Soil Resistivity (4% Weighting): Points will be awarded as follows:

Criteria	Points	Contrib.
Less than or equal 500 Ohm-Centimeters	100	4
501 to 1000 Ohm-Centimeters	80	3.2
1001 to 2000 Ohm-Centimeters	60	2.4
2001 to 4000 Ohm-Centimeters	40	1.6
4001 to 10,000 Ohm-Centimeters	20	0.8
Above 10,000 Ohm-Centimeters	10	0.4

Default = Above 10,000 Ohm-Centimeters

B) Corrosion Survey Criteria (5% Weighting): Points will be awarded as follows:

Criteria	Points	Contrib.
No CIS*/ readings	50	2.5
CIS & meets criteria for acceptance	-100	-5
CIS & does not meet acceptance criteria	300	15

* CIS – (Close Interval Survey) This information is provided to the RMP by the Corrosion Engineer and, if acceptable, is considered valid for ten years. If the CIS does not meet acceptance criteria, it is valid until repeated.

C) Coating Visual Inspection[1] (8% Weighting): Points awarded as follows:

Criteria	Points	Contrib.
Severely disbonded, (Poor)	100	8
Locally damaged, disbonded (Fair)	50	4
Superficial damage only (Good)	20	1.6
Intact and bonded (Excellent)	10	0.8
Bare Pipe or No Inspection (Coating Age[2] ≤ 5 Years)	11	0.88
Bare Pipe or No Inspection (Coating Age[2] > 5 to ≤ 20 Years)	19	1.52
Bare Pipe or No Inspection (Coating Age[2] > 20 to ≤ 30 Years)	29	2.32
Bare Pipe or No Inspection (Coating Age[2] > 30 Years)	51	40.8

[1] Inspection data greater than 20 years old shall not be used unless the information reflects a condition that is fair or poor. In such cases, points will be awarded per the inspection regardless as to when the inspection was performed.

[2] For Bare Pipe substitute Pipe Age.

D) Casing Survey (3% Weighting): Points awarded as follows:

Criteria	Points	Contrib.
No casing or Gelled	0	0
Existing casing	20	0.6
Metallic shorted casing	100	3

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E) In-Line-Inspection (ILI) (5% Weighting): Points awarded as follows:

Criteria	Points	Contrib.
No survey performed	0	0
Inspection > 10 years old	-100	-5
Inspection 5 to 10 years old	-300	-15
Inspection 2 to <5 years old	-600	-30
Inspection <2 years old	-600	-30

F) External Corrosion Leak[1] Rate (14% Weighting): Points awarded as follows:

Criteria	Points	Contrib.
Leak in last 5 years	100	14
Leak in last 10 Years	80	11.2
Leak age >10 years	50	7
No reported Leaks	0	0

[1] Points applied to all pipe segments of similar vintage and coating type within a 1 mile radius of a leak.

G) Coating Design (8% Weighting): Points awarded as follows:

Criteria	Points	Contrib.
Shielding Coatings	100	8
Non-Shielding Coatings	10	0.8
Bare	30	2.4
Paint	10	0.8
Default (Installation date ≥ 1960 – Assume Tape or equiv.)	100	8
Default (Installation date ≤ 1960 – Assume HAA or equiv.)	10	0.8

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H) DC/AC Interference (10% Weighting): Points awarded as follows:

Criteria	Points	Contrib.
High or medium voltage within 500' of a Gas Pipeline without Cathodic Protection	100	9
High or medium voltage w/i 500' w/CP	50	4.5
No high or medium voltage	0	0

I) Coating Age (5% Weighting): Points awarded as follows:

Criteria	Points	Contrib.
>30 years	100	5
>20 to 30 years	80	4
>10 to 20 years or uncoated	30	1.5
10 years or less	10	0.5

J) MOP vs. Pipe Strength* (8% Weighting): Points awarded as follows:

Criteria	Points	Contrib.
>60%	100	8
50% to 60%	80	6.4
40% to <50%	50	4
30% to <40%)	30	2.4
20% to <30%	10	0.8
Less than 20%	5	0.4

* Pipe Strength shall be determined to be equal to (SMYS)(2)(t)(Jef)/(OD).

K) Pipe Visual Inspection[1] (10% Weighting): Points awarded as follows:

Criteria	Points	Contrib.
Heavy pitting or gouging (Poor)	100	10
Light pitting or gouging (Fair)	50	5
Heavy rusting	20	2
Light rusting (Good)	10	1
No pitting or rusting (Excellent)	0	0
No Inspection (Pipe Age ≤ 5 Years)	0	0
No Inspection (Pipe Age > 5 to ≤ 20 Years)	10	1
No Inspection (Pipe Age > 20 to ≤ 30 Years)	20	2
No Inspection (Pipe Age > 30 Years)	40	4

[1] Inspection data greater than 20 years old shall not be used unless the information reflects a condition that is fair or poor.

In such cases, points will be awarded per the inspection regardless as to when the inspection was performed.

L) Test Pressure (TP)(5% Weighting): Points awarded as follows: 5

Criteria	Points	Contrib.
No Records Available	0	0
TP age is ≤ ASME B31.8S Table 3 requirements for Hydrostatic Test Interval	-200	-10
TP age is ≤ 3 years more than ASME B31.8S Table 3 requirements for Hydrostatic Test Interval	-100	-5
TP is > 3 years more than ASME B31.8S Table 3 requirements for Hydrostatic Test Interval	0	0

M) External Corrosion Direct Assessment (ECDA) (Weighting 10%) Points awarded as follows:

Criteria	Points	Contrib.
ECDA Completed*	-200	-20
ECDA Not Completed	0	0

* ECDA must have been completed within the last ten years.