



AMERICAN COLLEGE OF
OCCUPATIONAL AND
ENVIRONMENTAL MEDICINE

April 9, 2013

Chemical Safety and Hazard Investigation Board
Office of Congressional, Public, and Board Affairs
2175 K Street, NW, Suite 650
Washington, DC 20037

Attn: D.Horowitz,

To Whom It May Concern:

The American College of Occupational and Environmental Medicine welcomes the opportunity to comment on the Chemical Safety Board's draft evaluation of the American Petroleum Institute (API) and the United Steelworkers International Union (USW) jointly lead development of an ANSI consensus standard with guidelines for fatigue prevention.

ACOEM, an organization of more than 4,000 occupational physicians and other health care professionals, provides leadership to promote optimal health and safety of workers, workplaces, and environments.

ACOEM recognizes the important role of Fatigue Management in maintaining a safe and healthy workforce. For this reason, in February of 2012, ACOEM published a Guidance Statement entitled *Fatigue Risk Management in the Workplace*. This Guidance Statement notes that:

"Employee alertness depends not only on how many hours worked but also on a variety of other factors including:

- what one does at work;
- when one is at work (relative to the individual's circadian rhythm);
- whether the work environment promotes alertness or fatigue;
- whether there are mechanisms in place to detect excess fatigue;
- whether one obtains adequate sleep during time off or uses that time for other purposes;
- whether one has a sleep environment that promotes high-quality restorative sleep; and
- whether one has emotional, physical, or medical issues that interfere with high quality restorative sleep."

Because of the multifactorial nature of fatigue risk, no one solution, including Hours of Service (HOS) Guidelines, is sufficient to adequately mitigate that risk. For this reason, ACOEM advocates the use of a Fatigue Risk Management System (FRMS).

“Although several of these factors are under the control of an employer, others are not. Thus, it is critical to enlist the entire workforce as active partners in managing risk associated with fatigue. Increasingly, industry and regulators are moving away from pure hours-of-service standards toward comprehensive FRMSs designed to promote alertness, minimize fatigue, identify evidence of excess fatigue, and mitigate either the fatigue itself or its potential consequences.” (ACOEM Guidance Statement, *Fatigue Risk Management in the Workplace*¹)

ACOEM advocates that employers take direct steps to address those factors under their control such as the work environment and HOS. For other matters, the employer should work to motivate and educate the workforce to take steps to maximize their alertness on the job. They should also strive to foster a culture in which employees feel empowered to raise fatigue-related issues.

The ANSI standard, RP-755, utilizes the FRMS approach outlined and advocated in ACOEM’s Guidance Statement, *Fatigue Risk Management in the Workplace*. We do not agree with CSB staff that:

“The document places undue emphasis on “soft” or “personal” components of fatigue control, such as self-evaluation by employees, evaluation by supervisors, and training and education, without supporting scientific evidence of their efficacy.”

Rather, ACOEM finds RP-755 to be a noteworthy standard that incorporates the components of an FRMS. Those components that CSB staff refer to as “soft” or “personal” are no more or less critical to the success of the FRMS than any others.

Thank you for your consideration of our comments. Please do not hesitate to contact me or Pat O’Connor, ACOEM’s Director of Government Affairs at 202-223-6222, should you have any questions regarding the concerns outlined above or this matter in general.

Sincerely,

A handwritten signature in black ink, appearing to read 'Karl Auerbach', enclosed within a thin black rectangular border.

Karl Auerbach, MD, MS, MBA, FACOEM
President

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http://www.acoem.org/uploadedFiles/Public_Affairs/Policies_And_Position_Statements/Fatigue%20Risk%20Management%20in%20the%20Workplace.pdf

Docket Number: CSB-13-01
David M. Cloud
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The National Sleep Foundation (NSF) commends the Chemical Safety Board (CSB) for its efforts to continue to seek improvements for the sleep health and safety conditions in the petrochemical environment.

NSF has taken previous measures to improve the ANSI 755 draft guideline (Tom Balkin, 2009) and remains concerned with the following items:

1.1 Overview: ANSI 755 states that fatigue management “should be addressed through a comprehensive FRMS” by establishing, for example, limits to HOS and minimum hours off after a work set. However, it is NSF’s view that these limits are excessive. The work sets for normal operations are 5 to 7 hours longer than what is usually recommended by experts, but in an attempt to justify the statement, says “the protections provided by an FRMS can help to safely extend these limits.” However, when we reexamine 1.1 we see the word “should”. If the HOS, work sets, hours off, extended shifts, etc. were developed within the context of an FRMS, it should be mandated (“shall”) to implement an FRMS, not simply recommended (“should”).

4.6 Individual Risk Assessment and Mitigation: Individuals are encouraged to be “aware of their level of fatigue” but people are poor judges of their own level of fatigue and the extent it negatively affects their performance. ANSI 755 should establish that it is the responsibility of the employer to identify and manage fatigue. The Standard needs to do more to detail how fatigue is reported and documented, as well as the specifics for training employers and employees to recognize and mitigate fatigue.

There should be a clear statement signed by the Responsible Executive establishing a non-jeopardy reporting policy for individuals who report being too fatigued, and the statement should also extend to any reports of errors. The policy should also include employee protection for reporting observations of serious fatigue in the workplace.

4.7 Incident/Near Miss Investigation: Accident investigations should be conducted “in a manner that facilitates the determination of the role” of fatigue as a cause to the incident. This practice will help document the effectiveness of the FRMS and help the system evolve toward optimal effectiveness. The FRMS is incomplete without a data-driven mathematical model to provide an estimate of workers' alertness/mental capacity based on estimated sleep and circadian rhythm information.

It is also suggested that data be collected on the severity and estimated monetary costs of all accidents, regardless of whether fatigue/human error was a causal factor. Fatigued individuals have slower reaction times, reduced situational awareness, and relatively decremented problem-solving skills, so they are less likely to initiate appropriate actions to mitigate the severity of all accidents (e.g. apply the brakes as fast). Thus, collecting and analyzing such data could help to assess the efficacy of the FRMS by showing that the system not only helps prevent human error-initiated accidents, but also facilitates the speed and appropriateness with which incidents are addressed.

4.8 HOS Limits: ANSI 755 appropriately recognizes that “consistently working at the limits shown is not sustainable” and for recommending a design to “prevent employees from frequently working at or near these limits over the long term.”

4.8.1.2 Outages: ANSI 755 says “due consideration should be provided” so employees are well-rested and fit for duty. However, NSF believes a system should be in place for how, when, and who determines if an employee reporting to work is indeed well-rested and fit for duty. This element should apply to all individuals reporting for work.

4.8.4 Call-Outs and 4.8.5 Exception Process: NSF suggests that when the exception process is invoked – as well as with outages – the risk assessment is documented after using a mathematical model to help assess increased risk.

4.9 Periodic Review of the FRMS: NSF believes these should be mandatory reviews, and the information (e.g. overtime, length of work sets, etc.) should be continuously captured and reviewed to assist with scheduling in the short term to determine, for example, which individual is the most rested and fit for duty at any given time. It is suggested that the review employ mathematical models to help determine how much of the variance in accidents/incidents was likely associated with fatigue vs. other factors.

Foreword: ANSI 755 says “at the end of this five year period, if not sooner, this document will be opened for review and amendment.” NSF appreciates the concept but suggests a major effort be contemplated, one which includes quantifiable FRMS data.

NSF appreciates the complexity of this endeavor and how challenging it may be to find knowledgeable experts to assist the industry. NSF stands ready to help in any way it can to promote improved sleep health and safety in America.



Docket Number (CSB-13-01)

Public Comments Submitted by ANSI to the U.S. Chemical Safety Board (CSB) re: *Draft Recommendations Evaluation for Public Comment Fatigue Risk Management Systems*

ANSI respectfully submits these comments to the CSB regarding the proposed *Draft Recommendations Evaluation for Public Comment Fatigue Risk Management Systems (Draft Recommendations)*. American Petroleum Institute (API), an ANSI-Accredited Standards Developer (ASD), developed one of the subjects of the *Draft Recommendations*, RPI 755 *Fatigue Risk Management Systems for Personnel in the Refining and Petrochemical Industries*, as an American National Standard (ANS). This means that RPI 755 was approved by ANSI and that ANSI's procedural requirements and oversight apply to it.

ANSI submits these comments for the purposes of: (1) raising awareness of the process by which ANSs are developed, including ANSI's goal of encouraging interested stakeholders to participate in the ANS process in order to have their views represented and considered; and (2) explaining ANSI's procedures for interested parties to suggest revisions to, or lodge formal challenges concerning, American National Standards (ANS). As detailed below, when processing and approving a standard as an ANS, such as RPI 755, (or considering challenges or appeals), ANSI takes no position on the technical content of the standard and no comments contained herein are intended to address the technical content of the documents at issue.

ANSI's Role in the American National Standards (ANS) Process

ANSI is the coordinator of the U.S. voluntary consensus standards system. ANSI serves as a facilitator, providing an infrastructure and process by which proposed ANSs may be vetted. ANSI's role is to safeguard the integrity of this system, which by design, is based on a private-public partnership that is driven by the needs of the range of markets in this country and by the public interest. ANSI's role in the standards development process is a procedural, not technical one. Approval of a standard as an ANS is based on a neutral assessment by the ANSI Board of Standards Review (BSR) of evidence provided by the sponsoring ASD of procedural compliance with ANSI's requirements as established in the "*ANSI Essential Requirements: due process requirements for American National Standards*" (www.ansi.org/essentialrequirements).

The ANS process includes a robust series of checks-and-balances that provide comprehensive due process safeguards, which are also mirrored in OMB A-119 and the definition of voluntary consensus standards contained therein. ANSI does not review or endorse the content of an ANS. Approval is based on evidence of procedural compliance. Due process is key to ensuring that ANSs are developed in an environment that is equitable, accessible and responsive to the requirements of various stakeholders. Evidence of

consensus may include, but is not limited to, documentation of outreach efforts to achieve balance, consideration of and response to timely comments submitted by participants in the consensus process, including comments submitted through a public review process, voting records and written notification of the right to appeal.

ANSI's procedures permit interested parties to participate in the approval of an ANS through, for example, voting membership on a consensus body or the submission of public comments. Participation includes the right to raise concerns about a possible lack of balance on a consensus body or a perceived dominance of one interest category over another, in the consensus process.

ANSI's procedural requirements include (but are not limited to) the following:

- Equal access to voting member status on ANS consensus bodies (voting groups) without any undue financial or other barriers to participation;
- Public notice at various phases in the development cycle, including an opportunity for public review and comment on all substantive drafts of the proposed standard;
- Good faith efforts to seek balance on an ANS consensus body;
- Consideration of all timely comments received whether from a voting member of a consensus body or a public review commenter;
- Appeals provisions relating to the ANSI-accredited status of ANS developers and the approval of standards as ANSs; and
- Mandatory procedural audit of ANSs sponsored by ANSI-Accredited Standards Developers as a condition of maintaining accreditation.

Maintenance of ANS and the Opportunity to Propose Revisions, Lodge Appeals or Seek Withdrawal

ANSI-Accredited Standards Developers are required to maintain ANSs on a regular cycle, not to exceed 5 years from the date of approval as an ANS. The opportunity to propose revisions to approved ANSs and to submit comments related to a specific standard's content exists under ANSI's procedures. ASDs are required to address and attempt to resolve timely comments submitted in accordance with their ANSI-accredited procedures. If materially affected and interested parties choose not to participate in the available ANS consensus development process, then they risk the possibility that their comments will not be considered. ANSI cannot require that any stakeholder group participate in a standards development process. Those who do choose to participate in an ANS development process, however, are assured of due process, first as a requirement at the standards development level, then via multiple opportunities through ANSI.

ANSI encourages informal resolutions of disputes related to an ANS development process whenever possible, consistent with the *ANSI Essential Requirements*. All ANSI-Accredited Standards Developers are also required to offer a procedural appeals process. With respect to a particular standard, the appeals process at the standards developer level is typically considered the first level of appeal. Participants who are unable to resolve their procedural concerns informally and then via the standards developer's appeals process may also file an

appeal with ANSI. ANSI's formal procedural appeals process is publicly documented and time-tested.

In addition to the right to file a procedural appeal in connection with concerns such as inadequate comment consideration, openness, lack of balance or dominance on an ANS consensus body, the *ANSI Essential Requirements* provide an opportunity for any materially affected and interested party to request the withdrawal for cause of an American National Standard. This option allows for a procedural review of evidence presented by an aggrieved party that an ANS is, for example, not in the public interest or unsuitable for national use.

API has authorized ANSI to state that ANSI's records with respect to API RP 755 indicate that no entity or individual has attempted to challenge it, file an appeal with ANSI or to request a withdrawal for cause.

Additional Reference Links

The following links may also be helpful as reference:

- What is ANSI?: www.ansi.org/whatisansi
- American National Standards Value: www.ansi.org/ansvalue
- American National Standards Key Steps: www.ansi.org/anskeysteps
- ANSI Essential Requirements: www.ansi.org/essentialrequirements
- ANSI-Accredited Standards Developers: www.ansi.org/asd
- Accreditation: www.ansi.org/accreditation

ANSI Contacts

For further information concerning the American National Standards process, please contact Scott Cooper (scooper@ansi.org) or Anne Caldas (acaldas@ansi.org).

Submitted by:

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April 12, 2013

CSB Docket Office
Docket CSB-13-01, Fatigue Comments
Chemical Safety and Hazard Investigation Board
Attn: Amy McCormick
2175 K Street, NW, Suite 650
Washington, D.C. 20037

RE: Request for Comments on Draft Evaluation of Recommended Practice on Fatigue Risk Management Systems for Personnel in the Refining and Petrochemical Industries

API appreciates the opportunity to provide the following comments on the CSB staff Draft Evaluation of Recommended Practice on Fatigue Risk Management Systems for Personnel in the Refining and Petrochemical Industries. The original CSB recommendation (2005-4-I-TX-7) stated:

Work together to develop two new consensus American National Standards Institute (ANSI) standards.... b. In the second standard, develop fatigue prevention guidelines for the refining and petrochemical industries that, at a minimum, limit hours and days of work and address shift work. (CSB2005-04-I-TX-R7a) In the development of each standard, ensure that the committees a) are accredited and conform to ANSI principles of openness, balance, due process, and consensus; and b) include representation of diverse sectors such as industry, labor, government, public interest and environmental organizations and experts from relevant scientific organizations and disciplines.

API, an American National Standards Institute (ANSI) accredited standards developing organization, followed its ANSI-approved procedures for standards development and published API/ANSI Recommended Practice 755, *Fatigue Risk Management Systems for Personnel in the Refining and Petrochemical Industries* in April 2010 (RP 755), with the following scope:

This recommended practice (RP 755) provides guidance to all stakeholders (e.g., employees, managers, supervisors, contractors) on understanding, recognizing and managing fatigue in the workplace. Owners and operators should establish policies and procedures to meet the purpose of this recommended practice. This RP was developed for refineries, petrochemical and chemical operations, natural gas liquefaction plants, and other facilities such as those covered by the OSHA

Process Safety Management Standard, 29 *CFR* 1910.119. This document is intended to apply to a workforce that is commuting daily to a job location.

It is API's position that RP 755 not only met the full intent of CSB recommendation 2005-4-I-TX-7 but actually exceeded it by producing a truly comprehensive fatigue risk management systems-based approach for ensuring a safer workplace. This standard is the first guidance on this critically important subject for the refining and petrochemical industry and is a step change in addressing worker fatigue. In fact, the National Sleep Foundation, in its comments during the public review of the draft RP 755 document, stated the following:

First, on behalf of the National Sleep Foundation, I would like to commend the American Petroleum Institute (API) for producing the draft document entitled "Fatigue Risk Management Systems for the Refining and Petrochemical Industries." This document outlines a fatigue risk management system that, if implemented, will help increase the alertness - and therefore the safety and efficiency - of workers in these critical industries.

Given the criticality of the subject matter, the standard was produced on an accelerated schedule, less than two years from project initiation to publication. We have waited nearly three years for the Chemical Safety Board response.

API is puzzled as to why the draft recommendation is to classify API's response to recommendation 2005-4-I-TX-7 as an "Open-Unacceptable Action (O-UR)." From the CSB website, this recommendation status is defined as such:

"Open - Unacceptable Action (O - UR) - Recipient responds by expressing disagreement with the need outlined in the recommendation and the Board concludes that further correspondence on, or discussion of, the matter would not change the recipient's position"

It is API's position that RP 755 meets the intent and is in full compliance with CSB's recommendation. CSB's staff evaluation and its recommendation of O – UR actually hinders industry's implementation of RP 755 to improve worker safety by causing confusion and uncertainty.

In addition, API published TR755-1, *Technical Support Document for ANSI/API RP 755, Fatigue Risk Management Systems for Personnel in the Refining and Petrochemical Industries*, to provide transparency on the sound science on which RP 755 is based. Therefore, CSB's action should be one of the following:

Closed - Acceptable Action (C - AA) - The recipient has completed action on the recommendation. The action taken meets the objectives envisioned by the Board.

Closed - Exceeds Recommended Action (C - ERA) - Action on the recommendation meets and surpasses the objectives envisioned by the Board

Or, at a minimum:

Open - Acceptable Response or Alternate Response (O - ARAR) - Response from recipient indicates a planned action that would satisfy the objective of the recommendation when implemented.

This status would align RP 755 with RP 754, both of which were developed and submitted during the same time period and under the same ANSI-approved procedures.

Regarding RP 754, the CSB stated – “In this case, ‘open-acceptable response’ means in effect that the board judges that the recipient is moving in the right direction but that more remains to be done.” Even if the CSB staff’s comments are accepted, RP 755 is certainly “moving in the right direction.”

However, the following analysis of the “Draft Evaluation of Recommended Practice on Fatigue Risk Management Systems for Personnel in the Refining and Petrochemical Industries,” with conclusions shown at the end of each section, details why C – AA or C – ERA are more appropriate conclusions.

API appreciates the opportunity to provide these comments and to participate in the public meeting scheduled for April 24, 2013.

Sincerely,

A handwritten signature in black ink that reads "Robert L. Greco" followed by a stylized monogram or initials.

Robert L. Greco, III
Group Director
Downstream and Industry Operations

API ANALYSIS ON THE CSB STAFF DRAFT EVALUATION OF API RP 755

Background: As part of the U.S. Chemical Safety and Hazards Investigation Board (CSB)'s investigation and report on the BP America Refinery Explosion, CSB made several recommendations to API regarding the revision and development of API standards. API, its members and our industry in general, have devoted vast resources to meet the intent of these CSB recommendations and have usually received acceptable responses. The current status of each recommendation is shown in Appendix A.

However, API disagrees with this staff assessment and recommendation to the Chemical Safety Board in the strongest sense possible. API has made every effort to fully meet the CSB recommendation and is pleased to provide this rebuttal to the staff evaluation.

CSB Comment #1: The document was not the result of an effective consensus process, and therefore does not constitute a tool that multiple stakeholders in the industry can “own.” It was not balanced in terms of stakeholder interests and perspectives, and did not sufficiently incorporate or take into account the input of experts from other sectors that have addressed fatigue risks.

API is an American National Standards Institute (ANSI) Accredited Standards Developer. This accreditation requires that first, API's procedures for standards development must be approved by the ANSI Executive Standards Council as meeting the “ANSI Essential Requirements: Due process requirements for American National Standards” and that the standards API develops meet these requirements. In short, when an American National Standard is proposed for development, a notice is initially filed via the Project Initiation Notice System (PINS) in the ANSI Standards Action Newsletter for public comment and consensus committee volunteers, and a consensus group is formed. When the ballot draft is available, an ANSI Board of Standards Review (BSR) 8 form is likewise published in the ANSI Standards Action Newsletter advising the public of the availability of the standard for public review with a comment period of 45 days along with the formal consensus body vote and consideration of both consensus body and public comments. Finally, the ballot results and comment resolution are provided to ANSI along with BSR 9 form for final processing and approval by the ANSI Board of Standards Review as an American National Standard. This information was submitted for API RP 755 to ANSI which reviewed and approved RP 755. The full process and timeline for RP 755 are detailed in the following sections.

Project Initiation Notice System (PINS):

As an ANSI accredited standards developing organization, API submitted a PINs for RP 755 on March 27, 2008 that was announced in the April 18, 2008 edition of ANSI *Standards Action* and was also included under the “Call for Members”. The PINs identified stakeholders as refining and petrochemical industry owners/operators; labor unions; government agencies and academia. It was API's intention that individuals with a direct and material interest from other areas would be included in a “general interest”

category. There were no responses for participation nor were there any responses to the PINs with regard to claims of conflict or duplication of existing American National Standards.

Federal Register:

As is API's normal practice, the API Standards Department includes their annual standards work plan in the *Federal Register*. That announcement is sponsored by the U.S. Department of Commerce—National Institute of Standards and Technology and included the proposed RP 755 document. The announcement appeared in the March 14, 2008 edition of the Federal Register. There were no responses for participation on the RP 755 committee.

Initiation of Targeted Outreach Efforts by Interest Category:

Subsequent to the announcement in *Standards Action* and the Federal Register, API began the process of reaching out to specific organizations and individuals to develop the consensus bodies for each new standard. During April and May 2008, a list was compiled by interest category identifying organizations and individuals that would be contacted with an invitation to participate on the consensus body being constituted. Interest categories included:

- Industry, Owners/Operators (Refiners)
- Industry, Owner/Operators (Chemicals)
- Academia
- Associations
- Engineering and Construction Firms
- General Interest
- Labor
- Government

These lists included API members, non-members and other interested parties.

Process for Outreach and Constituting the Consensus Body:

On May 12, 2008, a formal letter of invitation was sent to all the identified individuals/organizations advising them of the scope of the proposed standard, offering voting and alternate member status as well as observer status to those individuals who wished to participate and offer comments only. Included in the announcement was a response document which requested contact information, self-declaration of interest category and provided a link to further information on API's Standards Program and API's *Procedures for Standards Development*. API's intent was to schedule a "Kickoff Meeting" for all respondents during the summer of 2008.

July 31, 2008 “Kickoff Meeting”:

This initial meeting was held in Houston to facilitate attendance. API and ANSI procedures for standards development were discussed and representatives from the CSB, industry associations, and labor interest categories as well as other interest groups were in attendance. The group then split up into the separate consensus groups (as both RP 754 and RP 755 were under development simultaneously) for each document to begin discussing the individual tasks and make plans for future activities and meetings.

Meetings of Consensus Body:

The consensus body meeting continued for well over a year. The RP 755 consensus body generally agreed to a frequent meeting schedule with a target of completion by the end of 2009, with consensus body conducted nine face-to-face meetings during the time period. These meetings included a series of presentations with special expertise in the area of fatigue management, including the National Transportation Safety Board, the Nuclear Energy Institute, and, at the specific request of the USW Consensus member, Dr. Steven Hursh, President and Chairman of the Institute for Behavior Resources at the Johns Hopkins University School of Medicine. These outside presentations were sought out to ensure that the development of the standard was informed by the best science available, as the CSB recommendation stated that the group should consider “experts from relevant scientific organizations and disciplines.”

USW Withdrawal of Participation from the Consensus Body:

During the spring and summer of 2009, the United Steelworkers Union representatives (USW) raised concerns about the composition of the RP 754 and 755 committees and on August 2, 2009, the USW formally withdrew participation from both consensus bodies. There was no further communications from USW on either document, no comments were submitted by USW during the public comment period, and no notice of intent to appeal the standards was ever filed by the USW with ANSI.

In a letter of August 11, 2009 from Jack Gerard, President & Chief Executive Officer of API to the Honorable John S. Bresland, Chairman & CEO of the CSB, Mr. Gerard stated: The USW claims that API excluded certain stakeholders from the process in order to structure the committee to minimize the union’s influence. In fact, API went to great lengths to solicit a broad group of stakeholders for both standards committees, including announcing the development of these standards on API’s public website, using the *Federal Register* to communicate the same information to an even broader audience, following ANSI’s formal announcement procedures, and reaching out to a variety of technical and scientific organizations. Moreover, we invited the USW on numerous occasions to provide us with the names and contact information for additional stakeholders. In the cases where the USW did provide API with additional names (representatives of the International Brotherhood of Teamsters, and the International Chemical Workers Union Council for API RP 754) we promptly added those individuals

willing to participate to the requested committee.” Mr. Gerard also noted that “the USW had made significant contributions to the draft standards, and we are disappointed that it elected to withdraw from the joint endeavor at this late stage.” He concluded by indicating that API would continue to work toward finalizing these two important safety standards (RPs 754 & 755) by the end of 2009, at which point they would be submitted to the CSB and immediately made available to the refining and petrochemical industry. This information was made available on API’s public website.

Additional Outreach During the ANSI BSR-8 Comment Period:

The public review announcements for RP 755 appeared in the ANSI *Standards Action* of October 16, 2009. Subsequent to the announcements and consistent with API’s intent to circulate the documents to as broad an audience as possible, a list of additional “outside reviewers” was developed for the standard. The purpose of the additional targeted outreach was to take the opportunity of the public review period to solicit additional comments from individuals and organizations that did not accept the offer to participate as RP 755 committee members, or were identified later in the process as possible contributors. Seventeen individuals were identified by the RP 755 group. E-mails that included copies of the ballot drafts were sent directly to each of those individuals. Responders with an interest in commenting were provided access to the API web-based balloting system with instructions on how to submit guest comments. No comments were received as a result of the BSR-8 announcement in *Standards Action* nor were any comments received from USW or any other labor organization. Several additional comments were received due to the “outside review” circulation of the ballot draft documents including a commendation for RP 755 from the National Sleep Foundation supporting API’s efforts to publish a document that “will help increase the alertness - and therefore the safety and efficiency - of workers in these critical industries.”

Comment Resolution and Review:

Ballot comment resolution and review took place during December 2009. The conclusion of the balloting process resulted in the March 9, 2010 submittal of the ANSI BSR-9 for RP 755 in accordance with API’s *Procedures for Standards Development*, and ultimately approved by ANSI as an American National Standard in April 2010.

Most issues were addressed during committee meetings through the consensus process. The USW had many suggestions, most of which were addressed to their satisfaction. Even though the USW chose to leave the process, many of the clauses that were influenced by their contributions were carried through the standards development process, included in the ballot document and published. These are shown in more detail in Appendix B.

As part of the most recent national USW – industry labor agreement, the USW agreed to the following wording regarding fatigue risk management and API RP 755:

Fatigue Prevention

The Parties acknowledge that a Recommended Practice (RP) regarding Fatigue Risk Management Systems has been issued by the American Petroleum Institute (API), API Recommended Practice 755. The Parties agree to meet and discuss as soon as practicable, but no later than sixty (60) days from the ratification of this agreement, the application and implementation of this RP. The Parties will fulfill any bargaining obligations, where necessary, in connection with the implementation of the new RP, including changes to the existing contract language. It is agreed and understood that both Parties will provide support and cooperation to ensure successful implementation of the new RP.

Thus, USW supports implementation of API RP 755 therefore the other major stakeholder appears to “own” this tool for managing worker fatigue.

Finally, to buttress the science supporting the development of the standard an additional document, *TR 755-1, Technical Support Document for ANSI/API RP 755, Fatigue Risk Management Systems for Personnel in the Refining and Petrochemical Industries* was developed and published. This document identifies and explains the scientific and operational issues considered during the preparation of RP 755. By providing the reasoning behind the specific wording in the RP 755 document, this document supports each key statement in RP 755 in sequence so that it can be used in parallel with the RP 755 text.

To make this document accessible and manageable, key scientific sources and references are provided to help readers gain access to the scientific literature. Fatigue Risk Management Systems (FRMS) have emerged and been widely recognized as a more effective approach to managing and mitigating employee fatigue risk in the 24/7 workplace. The core feature of the FRMS is that it is a risk-informed, safety performance-based system. The FRMS implementation process first identifies all sources of fatigue risk in the business operation, then introduces mitigating policies, technologies, and procedures to reduce the risk, and most importantly then maintains them in a proactively-managed continuous improvement system. The FRMS methodology represents a significant step change from the traditional approaches of either relying on maximum limits to hours of work or minimum limits to hours of rest (variously called Hours of Service, Work-Rest Rules, Working Time Directives), or adopting intermittent or piece-meal solutions (e.g. a fatigue training program or a shift schedule redesign), depending on the interests and initiative of local site managers.

One essential feature of FRMS is that it is a system meant to be improved upon on a regular and continuous basis. It is not a set of guidelines designed for one-time compliance but instead provides a framework that will evolve over time, driven by the collection of data on fatigue risk and fatigue outcomes (e.g. fatigue-related incidents).

Conclusion #1

It is not only API’s contention but also ANSI’s position that API RP 755 fully meets the requirements of “ANSI Essential Requirements: Due process requirements for American

National Standards” and is a true consensus standard. It is API’s position that all procedural requirements were properly followed, significant efforts were made to ensure balance, the proper interest groups were identified and consensus was achieved. As ANSI noted in their recent written comments to the CSB, “ANSI cannot require that any stakeholder group participate in a standards development process.” In addition, ANSI’s comments noted that - “API has authorized ANSI to state that ANSI’s records with respect to API RP 755 indicate that no entity or individual has attempted to challenge it, file an appeal with ANSI or to request a withdrawal for cause.”

RP 755 combined with the Technical Support Document serve as an important first step for fatigue management for workers in the oil and natural gas industry.

CSB Comment #2 – The document lacks explicit requirements in the form of “shall” language for the essential elements of an effective fatigue management system.

API’s standards are developed using performance-based language. This approach allows for the use of prescriptive language when necessary while allowing for flexibility in achieving the standards’ goals and objectives through performance based language where appropriate. In order to implement this policy goal, API standards utilize a variety of expressions of provisions in its performance-based standards.

In API’s ANSI accredited Procedures for Standards Development, these expressions of provisions are defined as follows:

“Shall - Denotes a minimum requirement in order to conform to the standard.”

“Should - Denotes a recommendation or that which is advised but not required in order to conform to the standard.”

These terms are provided in the “Foreword” of each standard to ensure users of the standard fully understand their intent in each standard.

In the case of API /ANSI RP 755, both terms are used. The “shall” statements address requirements for the Fatigue Risk Management System approach, where the consensus body determined it was appropriate to provide that level of specificity, and the “should” statements appear in other sections of the standards where the consensus body determined that they wanted to provide additional guidance while providing flexibility for site level adoption. For example, most Hours of Service provisions are requirements (“shalls”) – provides management with a tool for worker time off for adequate rest/sleep (the purpose of the RP).

Regarding the CSB staff comment that “The document lacks explicit requirements in the form of “shall” language for the essential elements of an effective fatigue management system.”, the consensus body, based on the available science and site experiential knowledge also concluded as part of the consensus process that too many “shall”

statements could lead to an overly prescriptive, “check-list” type approach, rather than a management systems approach which has been shown to be more effective for managing worker fatigue (further details on this issue are discussed below). Refineries and petrochemical plants are highly complex manufacturing facilities, where a more “systems” based approach is much more appropriate in managing worker fatigue.

Additionally, RP 755 is not unique in its use of should and shall statements. For example, in API RP 753, *Management of Hazards Associated with Location of Process Plant Portable Buildings*, which was developed in response to CSB recommendation 2005-4-I-TX-2, there is a mixture of “should” and “shall” statements with the following ratios: 64% “should” statement and 36% “shall” statements. This document and API’s response to CSB Recommendation 2005-4-I-TX-2 was found to be “Closed - Acceptable Action (C - AA)” by the CSB - The recipient has completed action on the recommendation. The action taken meets the objectives envisioned by the Board.”

Likewise, the ratio of “should” to “shall” statements in API RP 754, *Process Safety Performance Indicators for the Refining and Petrochemical Industries* is 63% “Should” statements and 37% “shall” statements, and this standard was found to “Open - Acceptable Response or Alternate Response (O - ARAR)” - Response from recipient indicates a planned action that would satisfy the objective of the recommendation when implemented.”

In the case of ANSI/API RP 755, the ratio is almost identical to RP 753 and RP 754, with is 62% “should” statements and 38% “shall” statements. It should also be noted that RP 755 actually contains 22 more “shall” statements than RP 754, and as mentioned above, many of those are in the “hours of service” section, which CSB staff view as more critical.

And, as part of API’s ANSI accreditation, these standards are not static - all API standards reviewed on a regular, five-year basis, if not sooner. In many cases, as industry gains knowledge in the standard’s implementation, the inclusion of additional “shall” statements takes place, and the consensus body is able to add greater specificity. For example, when API updated its standard 521 *Guide for Pressure-relieving and Depressuring Systems*, from the 4th edition to the 5th edition, Addendum 1, this new edition now contains 130 more “shall” statements than the previous edition.

Consensus standards can and do have a mix of requirements, recommendations and best practices. This does not diminish from and often enhances worker safety. A simple “checklist” approach may be appealing on its face, but may not drive the management systems approach necessary for highly complex refining and petrochemical facilities. An analogy can be drawn from the 2012 OSHA-sponsored “Expert Forum on the Use of Performance-Based Regulatory Models in the U.S. Oil and Gas Industry, Offshore and Onshore.” At the forum, five agencies described the use of performance-based regulatory models and gave examples of their approaches. In each case, the agencies presented a model for the very same mix of prescriptive and

performance-based approach inherent in standards that utilize both “should” and “shall” statements. The following statements are taken from each agency’s presentation:

- The Bureau of Safety and Environmental Enforcement Strategy: *Blend Prescriptive and Performance-Based Approaches*
- The Environmental Protection Agency Approach: *Flexibility – one size doesn’t fit all and the responsibility lies with the facility...no one knows the facility better than those that run it. This approach “Prevents compliance for compliance sake”.*
- United States Coast Guard Offshore Safety: *Prescriptive & Performance Based Regulations*
- Occupational Safety and Health Administration Benefits of the Performance-based Model: *Flexible, Comprehensive, Adaptive, Creative Process Safety Management*
- The Pipeline and Hazardous Materials Safety Administration Perspective: *The best regulatory approach is a balanced combination of Prescriptive regulations...and Management-based regulations.*

Conclusion #2

Consensus standards like API RP 755 can have a mix of requirements, recommendations and best practices and still be very protective of worker safety.

CSB Comment #3 - The document places undue emphasis on “soft” or “personal” components of fatigue control, such as self-evaluation by employees, evaluation by supervisors, and training and education, without supporting scientific evidence of their efficacy.

1. CSB staff’s recommendation focuses on limits on hours and days of work and rest (“hard” components) which are insufficient to fully and properly address worker fatigue.

CSB staff is promulgating a fundamental misconception, deeply rooted in the history of fatigue management, by using the term “hard” to refer to hours of service limits and the term “soft” to refer to other fatigue countermeasures such as behaviors and actions taken by employees, supervisors and managers. Indeed, it was the well-documented failure of the Hours of Service (HoS) simple hard rules approach to managing fatigue in the last century that has led to the evolution, and now widespread acceptance, of comprehensive Fatigue Risk Management Systems (FRMS) as the preferred and much more effective approach.

CSB staff’s recommendation that RP-755 should focus on HoS limits on hours and days of work and rest (“hard” components) is an insufficient method to fully and properly address worker fatigue. Below is a brief review of the history of fatigue management to show how the misconception arose that HoS were effective and sufficient. The information below will then review the extensive evidence that non-HoS fatigue countermeasures are in fact highly effective and should not be dismissed as “soft” or inferior.

1. History of Fatigue Management

As the practice of operating at night with extended hours and 24/7 work schedules spread across multiple industries following Edison's commercialization of electric light in 1882, the fatigue caused by working long hours around-the-clock became a major social issue which led to the introduction of Hours of Service regulatory limits on work/duty duration and off-duty minimum time duration in most transportation modes and a few other specific industries by the middle of the 20th century.

In essence, the Hours of Service model of fatigue regulation used a prescriptive model that assumed that most of the risk of fatigue could be addressed by simply placing limits on the number of hours worked in a specified time period and providing for a minimum number of hours of rest between work shifts and between blocks of work shifts. The time of day or night of work and rest patterns over a period of days were not considered and were not part of the Hours of Service equation. As a result, the measurement of "successful" fatigue management was too often viewed as the business' compliance with the input variables (e.g. number of work/rest hour regulatory violations) rather than the evaluation of any output variables (e.g. actual fatigue levels, fatigue-related accidents). Hours of Service therefore encouraged a check-the-box mentality without consideration of whether fatigue risk was actually being managed.

By the early 1980s, it became apparent that the underlying assumptions of hours of service regulations were severely flawed. The emerging research on the circadian regulation of sleep and fatigue inevitably led to the conclusion that an employee could be fully compliant with hours of service but highly fatigued, or conversely could be non-complaint and fully alert and safe. The most significant factors influencing employee fatigue were determined to be the circadian times of work hours and sleep opportunity, and the consecutive number of hours awake. None of these were addressed by Hours of Service regulations.

The essential problem was that a large body of research (about 4,500 peer-reviewed publications per year) showed that the interactions between circadian and sleep processes and workplace fatigue were complex, and only some of the parameters could be managed by capping work hours or minimum rest rules. When attempts to incorporate circadian physiology into HoS rules were made, the rules became unmanageably complex.

Furthermore, strictly following the HoS regulations often created more fatigue risk than not following the HoS rules. For example, a study conducted in 2007 with a panel of 12 internationally recognized academic fatigue experts and a panel of 67 experienced truck drivers showed that strictly complying with the Federal Motor Carrier Safety Administration HoS regulations for commercial truck drivers rendered the drivers more fatigued as compared to being non-compliant and

sleeping and working at times based on the expert's knowledge of circadian physiology, and the driver's experience of managing sleep and fatigue on the road.

2. Evidence for the Efficacy of Personal Fatigue Management

The CSB staff report mistakenly opines that the non-HoS fatigue countermeasures built into RP 755 are “soft” and “without supporting scientific evidence of their efficacy.” To the contrary, there is actually more evidence that these non-HoS personal fatigue countermeasures are more effective than HoS rules are effective. Below is a brief review of the research literature comprised of thousands of scientific peer-reviewed publications to support this conclusion.

- **Sleep**

The so-called HoS “hard rules” prescribe rest period minimum durations but are silent on sleep duration and quality, which are the true determinants of recovery from fatigue. At best, HoS rules provide an opportunity for sleep but do not consider the feasibility of obtaining sleep, or success in obtaining adequate sleep. Actual sleep and recovery from fatigue is the result of a complex interaction between multiple factors discussed below. These are not addressed by HoS rest rules.

- **Homeostatic Process**

An individual's relative state of alertness or fatigue impairment is related to how long that person has been continuously awake. However, the change of sleepiness with elapsed time a person has been awake since their last sleep episode is not a simple function of elapsed time. It is also influenced by sleep inertia, circadian phase and homeostatic recovery pattern (Moore-Ede 2002).

HoS rules control only one part of the relationship between time awake and fatigue accumulation. They may govern time forcibly kept awake during work hours but they do not assess or control time awake before starting duty, which can be driven by a variety of factors. FRMS in contrast looks at the entire risk pattern and a variety of approaches including employee, supervisor and manager training systematically addresses all the factors that create fatigue risk.

- **Circadian Time of Day**

HoS work-rest rules cannot address the impact of the circadian time of day on sleep, without becoming excessively complex.

An individual's level of alertness and sleepiness typically varies over the course of the 24-hour day in a predictable bi-phasic circadian rhythm with the greatest sleepiness typically in the early hours of the morning before dawn (“circadian nadir”) and a second lesser period of sleepiness in the afternoon (often referred to as the “post-lunch dip” or the “siesta hour”). The circadian nadir correlates with a dip in alertness and measures of performance including reaction time and

driving simulator performance. However the circadian time of day ('circadian phase') is influenced by the timing of exposure to light and other time cues over the previous days and weeks, so it can shift significantly relative to the clock time on the wall (local geophysical time). FRMS countermeasures can be designed to promote a partial adjustment to night shifts, which results in improved sleep and increased alertness on duty with increasing consecutive night shifts, which can compensate for the initial sleep debt caused by sleeping at a reversed circadian phase.

Because management cannot control individuals' activities while not at work, it is critically important to explain the rationale for healthful and alertness promoting actions, explain what those actions are, provide the tools and resources to help them and to motivate them to take those actions.

There is a large difference in the effect of consecutive night shifts depending on whether shiftworkers are untrained and simply following HoS rules, and whether they are appropriately trained in a comprehensive FRMS program. Untrained shiftworkers may show deterioration in alertness with consecutive night shifts, but studies have shown that when people follow circadian sleep science-based guidance, there is actually an improvement of sleep and night shift alertness with increasing number of consecutive night shifts (Baker, 1995).

In short, the training on how to apply circadian sleep science in a shiftwork lifestyle which is a "shall" requirement in RP-755, is the effective approach and the HoS rules-based approach is comparatively ineffective (except for the purpose of preventing extreme abuses, which is also a "shall" requirement in RP-755). Section 3c below provides documentary evidence of the effective of these training programs.

- **Quality of Sleep**

HoS work-rest rules do not address the quality of sleep. To be fully restorative, sleep should not be interrupted by significant numbers of wake periods or arousals, the ultradian 90-100 minute cycles between the various stages of sleep (Stages 1-2-3-4 and REM) should follow their typical patterns, and all these sleep stages should be found in their adequate proportions. When sleep is disturbed by deviations from these typical sleep characteristics, it results in reduced alertness.

In contrast, FRMS addresses the quality of sleep by helping employees understand how to create the ideal sleep environment, how to schedule sleep, and encourage the effective treatment of sleep disorders.

2. Use of a Comprehensive Fatigue Risk Management System (FRMS) Approach is the Preferred Methodology to Address Fatigue Risk and Improve Safety

Over the past ten years, a broad international consensus has emerged across academia, government and industry that FRMS is the optimal way to manage and reduce employee fatigue risk in 24/7 operations. Government regulatory agencies of many countries, industry associations, and many businesses with 24/7 operations have now incorporated FRMS into their regulations, industry standards, and corporate policies.

The implementation of FRMS is now widespread across companies in many different industries and many different regions of the world. For instance, one literature review found 61 fatigue management programs in transportation operations alone. This review found that the three most commonly implemented program components are: schedule management, education and sleep disorder management (Phillips & Sagberg, 2010).

a) Examples of Industry Organizations and Government Regulators that Endorse and Promote the FRMS Approach

- Aviation Industry

- ICAO – International Civil Aviation Organization

“Prescriptive flight and duty time limits represent a somewhat simplistic view of safety-being inside the limits is safe while being outside the limits is unsafe- and they represent a single defensive strategy. While they are adequate for some types of operations, they are a one-size-fits-all approach that does not take into account operational differences of differences among crew members.

In contrast, an FRMS employs multilayered defensives strategies to manage fatigue-related risks regardless of their source. It includes data-driven, ongoing adaptive processes that can identify fatigue hazards and then develop, implement and evaluate controls and mitigation strategies. These include both organizational and personal mitigation strategies. While an FRMS is based on scientific principles, its application within various aviation contexts requires operational experience and knowledge. An FRMS should not be provided to an operator by a consultant; it needs to be developed, understood and managed by people who have comprehensive experience in the complex operational environment to which it will apply. In this way, various data analysis can be meaningfully interpreted taking into consideration particular contexts, and workable operational strategies can be developed.” (Manual for Regulators, 2012)

- IATA – International Air Transport Association

“FRMS is an enhancement to prescriptive flight and duty time limitations (FTLs). It allows an operator to adapt policies, procedures and practices to the specific conditions that create fatigue in a particular aviation setting.

Operators may tailor their FRMS to unique operational demands and focus on fatigue mitigation strategies that are within their specific operational environment.” (<http://www.iata.org/whatwedo/ops-infra/Pages/fatigue-risk.aspx>)

➤ United States

▪ Aerospace Medical Association

“Concurrent with the educational effort, a large-scale program should be undertaken to implement a non-prescriptive fatigue risk management system (FRMS) that determines optimum flight schedules from both a physiological and operational standpoint on a case-by-case basis since prescriptive hours-of-service limitations cannot account for human circadian rhythms or sleep propensity.” (Caldwell et al., 2009)

▪ Civil Aviation Safety Authority

“At present, CASA regulates flight and duty times for FCMs via CAO Part 48. This largely prescriptive legislation also permits operators to be exempt from its provisions (subject to CASA approval) via two alternative means:

- ✓ prescriptive limitations contained in Standard Industry Exemptions (SIEs) which are ‘class of operation’ specific; and
- ✓ safety case-based FRMS.

The emergent science on fatigue management within the last decade has shown that there is a need for regulatory bodies in transport industries, and operators, to become more aware of human performance limitations and to organize work practices so that the resultant operational safety risk is kept within acceptable boundaries. This issue is highlighted further as aircraft become more sophisticated, and may fly for longer periods, together with a growing trend towards shift work.” (NPRM 1202OS, May 2012)

▪ FAA – Federal Aviation Administration

“Fatigue Risk Management System. An airline may develop an alternative way of mitigating fatigue based on science and using data that must be validated by the FAA and continuously monitored.

In 2010, Congress mandated a Fatigue Risk Management Plan (FRMP) for all airlines, and the carriers have developed these plans based on FAA guidance materials. An FRMP provides education for pilots and airlines to help address the effects of fatigue, which can be

caused by overwork, commuting, or other activities. Airlines will be required to train pilots about the potential effects of commuting.

Required training updates every two years will include fatigue mitigation measures, sleep fundamentals and the impact to a pilot's performance. The training will also address how fatigue is influenced by lifestyle — including nutrition, exercise, and family life — as well as by sleep disorders and the impact of commuting.” (FAA Press Release, December 21, 2011)

➤ Canada

▪ Transport Canada Civil Aviation

“In general, fatigue has traditionally been managed using a single layer of defence (i.e., limits on work hours). The assumption is that compliance with the limits on working hours is evidence that an employee is adequately rested and fit for work and will not make any fatigue related errors. This may not always be the case. Without supplementary defensive layers it is entirely possible for an employee to comply with working hour limits but to be too tired to work safely (e.g., had a 12 hour break from work but didn't get enough sleep due to a sick child or a night out on the town.” (Advisory Circular, March 22, 2011).

➤ Europe

▪ EASA – European Aviation Safety Authority:

“An operator shall establish and maintain a fatigue risk management system: The FRMS policy shall have a process for setting safety objectives and performance standards clearly defined lines of safety accountability, including senior management. The FRMS shall correspond to the size, nature and complexity of the flight time specification scheme, and the associated risks arising from crew member fatigue.” (EASA EASA Rules Seminar, Paris, 16 October 2008)

➤ Australia

▪ CASA - Australian Civil Aviation Safety Authority

“CASA has just published the final rule for a new scheme for managing aircrew fatigue. Under CASA NFRM 1202OS - Fatigue Management for Flight Crew Members, operators and flight crew will have a shared responsibility to manage fatigue. The new CAO adopts a tiered approach to managing fatigue, ranging from prescriptive requirements to a mix of prescriptive and fatigue management (FM) to a fully-developed fatigue risk management

system (FMRS) which replaces prescriptive rules with a safety case-based scheme.

This tiered system allows operators to choose how they manage fatigue in their organizations based on their operating environment and needs, and at the same time make improvements in the light of current sleep and fatigue research.”

<http://www.casa.gov.au/wcmswr/assets/main/newrules/ops/nfrm/1202os.pdf>

- Healthcare Industry

- Joint Commission: (Sentinel Event Alert, December, 2011)

For all organizations:

1. Assess your organization for fatigue related risks. This includes an assessment of off shift hours and consecutive shift work, and a review of staffing and other relevant policies to ensure they address extended work shifts and hours.

2. Since patient hand-offs are a time of high risk especially for fatigued staff assess your organization's hand-off processes and procedures to ensure that they adequately protect patients.

3. Invite staff input into designing work schedules to minimize the potential for fatigue.

4. Create and implement a fatigue management plan that includes scientific strategies for fighting fatigue. These strategies can include: engaging in conversations with others (not just listening and nodding); doing something that involves physical action (even if it is just stretching); strategic caffeine consumption (don't use caffeine when you're already alert and avoid caffeine near bedtime); taking short naps (less than 45 minutes). These strategies are derived from studies conducted by the National Aeronautics and Space Administration (NASA), which state that people can maximize their success by trying different combinations of countermeasures to find what works for them. The NASA studies stress that the only way to counteract the severe consequences of sleepiness is to sleep. Strategies for determining shift durations and using caffeine to combat fatigue can be found in chapter 40 of "Patient Safety and Quality: An Evidence-Based Handbook for Nurses."

5. Educate staff about sleep hygiene and the effects of fatigue on patient safety. Sleep hygiene includes getting enough sleep and taking naps, practicing good sleep habits (for example, engaging in a relaxing pre-sleep routine, such as yoga or reading), and avoiding food, alcohol or

stimulants (such as caffeine) that can impact sleep. (Sentinel Event Alert, December, 2011)

- ACGME – Accreditation Council for Graduate Medical Education
The program must:

1. educate all faculty members and residents to recognize the signs of fatigue and sleep deprivation;
2. educate all faculty members and residents in alertness management and fatigue mitigation processes; and,
3. adopt fatigue mitigation processes to manage the potential negative effects of fatigue on patient care and learning, such as naps and back-up call schedules.

Each program must have a process to ensure continuity of patient care in the event that a resident may be unable to perform his/her patient care duties. [http://www.acgme.org/acgmeweb/Portals/0/PDFs/dh-TaskForceResponsesComments\[1\].pdf](http://www.acgme.org/acgmeweb/Portals/0/PDFs/dh-TaskForceResponsesComments[1].pdf)

- Maritime
 - Transport Canada – Coastguard

The fatigue management program includes the following components:

- sleep and fatigue awareness training for management and pilots;
- proposed guidelines for scheduling assignments;
- guidelines for FMP implementation (support resources, process, responsibilities, etc.); and
- an FMP evaluation process.

<http://www.tc.gc.ca/media/documents/marinesafety/13958e.pdf>

- Pipelines
 - PHMSA and PRCI (API RP 1168): *The Liquid Pipeline Operator's Control Room Human Factors Risk Assessment and Management Guide was published in 2008 and each of the separate guide elements is intended to support a progressive, integrated process of information gathering, analysis and documentation.*

“The operator is responsible for determining the fatigue risks that exist in its program, and appropriate mitigation tactics to implement given the operating environment (schedule, control room set-up, etc.) to reduce those risks. In general, fatigue mitigation tactics may include provisions for on-the-job napping, provisions for tactical caffeine use, standing (e.g., use of sit/stand workstations) procedures for double-checking checklist completions, task rotations to reduce the effects of task-specific fatigue,

exercise areas, activities intentionally injected at specific times in the shifts when the risk of fatigue is high, and mechanisms in place to help deal with controllers who are self-identified or identified by supervisors as being fatigued. The operator should be aware that certain mitigation tactics may or may not work for certain individuals. There should be some flexibility to allow for countermeasures based on individual differences, and communication amongst the appropriate stakeholders within the organization to know what typically does or does not work best for certain individuals.” (primis.phmsa.dot.gov/crm/faqs.htm)

- Railroad
 - FRA – Federal Railroad Administration
 - Rail Safety Improvement Act of 2008: all Class 1 railroad carriers must develop and update, at least once every 2 years, a fatigue management plan*
 - “Fatigue is a complex, multifaceted issue”
 - FMPs should take into account the multifaceted nature of fatigue by employing a variety of countermeasures, scheduling practices, educational interventions, and increased opportunities for rest
 - FMPs should be flexible enough to take into account the diverse nature of the different railroads submitting FMPs and the diversity of the employees who will be covered under these plans, but still be driven by current scientific understanding.” (FRA-Railroad Safety Advisory Committee, December 8, 2011)
- Trucking
 - National Transport Commission (NTC)
 - “Merely adhering to prescribed drive, work and rest hours and completing work diaries/logbooks may not be enough to comply with the general duties under OH&S laws and the new laws. Good fatigue-management practices encompassing a fatigue management system with a systematic risk-management approach is also essential.” (NTC Guidelines, August, 2007)
 - National Heavy Vehicle Regulator (NHVR), Australia
 - “Under compliance and enforcement provisions, everyone in the supply chain has a general duty to ensure breaches of road transport laws do not occur. All parties need to make sure that their action or inaction does not contribute to or encourage breaches of road transport laws. If a party’s actions, inactions or demands cause or contribute to road safety breaches they can be held legally accountable.” (<https://www.nhvr.gov.au/safety-accreditation-compliance/chain-of-responsibility/roles-and-responsibilities-of-parties-in-the>)

2. Examples of Academic Societies that Endorse and Promote the FRMS Approach

There are many academic societies which have organized meetings and conferences on FRMS science and implementation in industry. A few examples are provided here:

- American College of Occupational and Environmental Medicine (ACOEM)

The Task Force on Fatigue Risk Management issued a guidance document for FRMS implementation across all 24/7 industries which covers staffing levels, scheduling, overtime, education and training and incident investigation.

- “FRMS is science based, data driven, and subject to continuous improvement; in short, it is a system to manage risk associated with fatigue.
- Fatigue risk management systems are designed to improve outcomes and are more flexible than duty-rest and hours-of-service regulations.
- All stakeholders share responsibility for complying with and improving an FRMS.

(Lerman et al., 2012)

- European Society for Aerospace Medicine

“The Advisory Board of ESAM supports further development and implementation of Fatigue Risk Management Systems in airlines, because it provides the opportunity to better match operational needs and fatigue-related flight safety considerations. It stimulates collaboration of management and crew, who share the responsibility for an optimal balance of operational criteria and performance criteria in pursuit of commercial objectives. A FRMS can be used within the envelope of prescriptive flight and duty time limitations or as an alternative to such prescriptive rules that provides at least an equivalent level of safety.” (Simons et al., 2010)

- Global Fatigue Risk Management System (FRMS) Forum

Launched in 2009 and includes 65 organizations (as of 2011) (regulators, airline operators, and academic institutions).

- “The aim of this Forum is to openly discuss FRMS issues and collaboratively build a body of knowledge for the establishment of Best Practise for the unencumbered use of members.
- Air New Zealand, easyJet, Delta Air Lines, Virgin Atlantic and QinetiQ initiated this Forum with significant support from UK Civil Aviation Authority for the airline industry. The FRMS Forum was launched on 8th

May 2009 and is managed by volunteer, elected members and operated for the benefit of the membership.

- The Forum provides a vehicle for industry specialists to meet to share knowledge and experiences of creating, developing and managing an FRMS. The output will be a growing, shared body of knowledge that is Best Practise for the industry.”

(www.frmsforum.org/about_us/index.html)

3. A Major Contributing Factor to Worker Fatigue is Activity Away from Work

The majority of a shiftworker's time is spent away from the workplace. Out of the total 8,760 hours in a year, allowing for three weeks of vacation, a typical shiftworker without overtime only spends 1,960 hours in the workplace a year. With an average of 20% overtime, he/she spends 2352 hours at work per year. Thus, 72-78% of the hours in a year (non-workplace time) are controlled by the shiftworker's personal lifestyle choices.

During this non-workplace time, the employee decides how to spend that time based on personal lifestyle choices, family and social issues and economics, as follows:

- Where and when to sleep
- The quality of the bed/mattress and bedroom environment
- Nutrition
- When to seek care for possible sleep disorders
- Addressing other medical or psycho-social issues which may impact alertness
- Use of caffeine, alcohol and other substances
- How far to commute to work (duration of commute)
- Activities at night or during other rest periods
- The physical exertion associated with hobbies, recreational and sport activities
- Community service and other activities
- Other secondary employment time.

a) Hours of Service Rules are Ineffective in Controlling Employee Behavior Off-Duty

Hours of service rules have very little impact on how employees spend the over 6,000 hours of personally-controlled time they have at their disposal each year. Except for a few exceptions, such as when a shift schedule provides too short an interval between two work shifts for adequate sleep, Hours of Service rules have little impact in influencing employee off-duty behavior. (Note: RP-755 in the Hours of Service rules, effectively addresses the specific risk of too short turnarounds between shifts with “**shall**” language).

Hence relying on a Hours of Service rules-based approach to control employee behavior is unrealistic and fruitless.

2. The FRMS Approach is Effective at Improving Employee Personal Fatigue Management Behavior Away from Work

In contrast to Hours of Service rules, FRMS provides a very effective way of influencing and modifying employee behavior away from the workplace. It is this essential and most important part of fatigue risk management that the CSB staff unfortunately and erroneously dismisses as “soft” and “without supporting scientific evidence of their efficacy.”

API will review below the considerable evidence that shows well-designed and delivered training programs for shiftworkers create significant behavioral change and significant reductions in fatigue risk. The literature documenting the effectiveness of fatigue training is substantial - below are just a few examples:

- Evaluation of Driver Training as a Fatigue Countermeasure (Gander, 2005)

As part of a comprehensive fatigue management approach, driver education programs were developed and implemented for light vehicle drivers working for a major oil company and heavy vehicle drivers working for its distributors. Follow-up surveys after training found that fatigue-related knowledge was retained 1-26 months after training and approximately half of the drivers changed their fatigue strategies at both home and work:

- 47% of the respondents (heavy vehicle drivers) had changed their strategies at home (e.g. sleep habits, diet, exercise and use of caffeine).
- 49% of the respondents (heavy vehicle drivers) changed their strategies at work (e.g. diet, use of caffeine, roster change, pattern of breaks across shift).
- 50% of the respondents (light vehicle drivers) had changed strategies at home.
- 43% of the respondents (light vehicle drivers) had changed strategies at work.
- 14% of the heavy vehicle drivers reported changing their diet at home (Phillips & Sagberg, 2010).

- Evaluation of Managing a Shiftwork Lifestyle Training

A study of shiftworkers from a major surface mining company had a significant increase in average daily sleep length after attending a “Managing A Shiftwork Lifestyle” training workshop, increasing their average nocturnal sleep length by 16 minutes (7 hours 33 minutes to 7 hours 49 minutes) and average daytime sleep when working the night shift by an hour (4.8 hours to 5.8 hours) (Kerin & Dawson, 2004).

- Evaluation of a Fatigue Countermeasures Training Program for Flight Attendants

50 domestically-based flight attendants received a fatigue countermeasures training program. This showed improvements in their self-efficacy for addressing fatigue and the strength of their attitudes toward fatigue and the importance they place on fatigue management. Forty-one percent of flight attendants utilized naps for fatigue management compared to 27.8% before training and obtained more nightly sleep after training (7.37 hours up from 6.78 hours) (Hauck et al., 2011).

- Evaluation of a Driver Training Program (Televert)

A study published in 1996 evaluated four interventions (driver training, group discussions, campaigns and bonuses for accident-free driving) implemented by a Swedish telephone company. Work hours were not guided by prescriptive HoS rules. The results for the driver training group showed a statistically significant reduction of 40% in the accident rate while group discussions showed a decline in the accident rate by 56% in two years (Grayson & Helman, 2011).

- North American FMP for Truck Drivers

Multi-level education through train the trainers, sleep monitoring and treatment programs was implemented in trucking companies. The results showed that drivers slept longer and more efficiently during the post-FMP than the pre-FMP condition on duty days. Drivers also reported fewer close calls or nodding off after than before the FMP. (Freund, 2010)

- Evaluation of an FRMS on the Night Shift (ChevronTexaco)

A refinery in El Segundo CA had 40% of its staff working nights. A program including education via computer-based training, sleep-disorder screening, shift schedule alignment, policies affecting fatigue management and changing the work environment was implemented. Employee surveys indicate that the shift workers at the refinery are now less fatigued and feel better about coming to work.

- Queensland Transport

In 1994, the Queensland Transport with 8-9 road transport companies initiated the first pilot of a Fatigue Management Program. In order to be accredited and to operate outside of the standard prescriptive limitations, companies participating in the trial had to be able to demonstrate that they met ten¹ fatigue management standards. The evaluation showed:

- Increased awareness of fatigue issues

¹ 1. Rostering; 2. Flexible operating limits; 3. Readiness for duty; 4. Health management system; 5. Effective communication between managers and drivers; 6. Sleeping environment; 7. Training and Evaluation; 8. Responsible for awareness of fatigue; 9. Documentation; 10. Internal review

- Over 4 years, the ratio of drivers reporting use of 'stay awake' pills has dropped from 11 in 31 drivers to 1 driver in 25.
 - Decrease in accidents, injuries and subsequent workers compensation claims
 - Positive effect on business efficacy as measured by truck utilization, customer satisfaction, fatigue related accidents and driver turnover (Phillips & Sagberg, 2010)
- Evaluation of a Driving Fatigue Management in Oil & Gas Operations in Brazil

A driving fatigue management program which included fatigue management awareness training, journey management/driver rest evaluation, management commitment and leadership workshops, road-hazard mapping, contracting of hotels in strategic locations, and a pre-job fatigue evaluation process which enhanced other existing corporate safety programs was implemented to supplement the prescriptive HoS. An evaluation showed that implementation of the "soft" non-HoS elements resulted in an increase in fatigue awareness and decline (35% of company automotive accidents in the company's business unit were identified as fatigue-related in 2008 compared with 9% in the first ten months of 2009)(Camargo et al, 2010).

Conclusion #3

Focusing on hours of service or "hard" components is insufficient and short-sighted. The more effective and more widely accepted approach is the use of an FRMS which does include "soft" or "personal" components. API does not believe that there is "undue emphasis" on such components in RP 755 – all FRMS components are important.

Comment #4 - Although the RP requires limits on hours and days at work, the limits are generally more permissive, and therefore less protective, than those suggested by current scientific knowledge. The permissive limits are based on an unproven assumption that implementation of a particular FRMS will "compensate" for the risk from excessive hours and days at work.

1. The Hours of Service Limits in RP 755 Were Informed by the Science But Also Took Into Account Practical & Operational Considerations

The API committee which developed the RP-755 standard had multiple briefings on the science of circadian and sleep physiology and fatigue risk management in operational 24/7 environments, during its two years of deliberations. Expert scientific advisors were present at all the meetings, and guest experts were brought in to expand the knowledge base of the committee. As a result, the RP 755 ANSI standard development process was fully informed by the relevant science, both from outside expert speakers as well as the subject matter experts on the committee that have vast experience in working with other industries.

The committee also recognized that employee fatigue is only one of the many risks which a petrochemical facility has to manage. So, for example, the overall risk management of a facility has to take into consideration not only the risk of extending employee hours to cover an unexpected event but also the relative risk of being forced to leave a station unattended because a certain work hour limit has been reached. The Hours of Service rules thus have to be sufficiently flexible and not excessively rigid so that managers on a day-to-day basis can weigh not only the risk of fatigue but the risk associated with gaps in coverage.

An interesting example of this need for a broader view of risk and flexibility in hours of service limits occurred in scheduling shifts in off-shore oil platforms in the North Sea. Concerns were raised by European regulators about the fatigue risk with 14-21 days of consecutive 12 hours shifts worked on the platforms, and they suggested that employees should be flown back and forth to the rig every 7-days instead of every two-three weeks. However, a multi-factor risk analysis showed that the fatality risk on the helicopter flight was 83 times the risk of working on the rig, and so risk increased by converting to 7 day work sets. Subsequently, it was found that the average daily amount of sleep night shift employees got on the rigs working 14-21 consecutive 12-hour shifts was significantly greater than they got on 4-7-day blocks working on-shore, resulting in lower fatigue risk.

2. An FRMS Approach Can be Used as the Basis for a Data Collection Effort

A fundamental attribute of FRMS is that it is a continuously improving data-driven process that looks at each 24/7 operation and determines where the true risks lie. There should be caution in applying too restrictive HoS rules based on incomplete theory, which preclude the opportunity to find where the actual risk lies.

The off-shore shift schedule example above illustrates that current science has limitations particularly when it comes to applications to real-world 24/7 operations and answers may not be available until more data is collected. If the assumption had been made based on laboratory data or simple minded theory, rather than actual data from off-shore rigs, the safety of 14 consecutive, 12-hour night shifts would not have been established and needless risk and cost would have been incurred.

3. CSB staff are Incorrect in Their Claim that Implementation of an FRMS to Allow More Permissive Limits on Hours of Service is an “Unproven Assumption”

Contrary to the CSB staff assertion, the relaxation of hours of service limits when the added protections of an FRMS are in place is a broadly accepted feature of the FRMS approach to fatigue risk management which is built into many fatigue management schemes. To illustrate this, API provides a few case studies from different industries as shown below:

a. FRMS Approach Does “Buy” Flexibility to Extend Hours of Service

- Case Study: Expansion of Flight-Time/Duty Time Limits under FRMS with Ultra-Long Range (ULR) Flights

Beginning in 2008, the U.S. aviation industry embarked on a large-scale aircrew fatigue risk data collection study involving several leading passenger air carriers (American, Delta and Continental) with the ultimate goal of making the transition from prescriptive flight-time duty-time regulations to evidence-based Fatigue Risk Management Systems supported by validated fatigue risk models. The impetus to embark on this study was the capability of modern aircraft (e.g. 777, 787) to operate on ULR routes where the block-block flight time exceeded the 16-hour maximum allowed under current Federal Aviation Administration (FAA) regulations. Recordings monitored pre-flight sleep, onboard rest with augmented crews, layover sleep, recovery sleep following each trip, as well as all sleep between recovery and preflight. This collaborative effort involved air carriers, pilot and flight attendant unions, FAA and a Scientific Steering Committee. Analysis of the data showed that as much or more sleep was obtained and fatigue risk was actually lower on the over-16 hour ULR flights as compared to other shorter international flying duty-rest patterns. The FAA approved an exemption to the 16 hour limit in ULR operations provided aircrews operated within an FRMS structure that included training and other non-HoS countermeasures. (Caldwell et al., 2009)

- Case Study: EasyJet, UK

In 2005, EasyJet developed an FRMS to support an application to work outside the local flight and duty time limitations. The FRMS has evolved to include scientific research studies, a crew fatigue reporting system, processes for investigating safety events for fatigue, a fatigue safety action group that meets monthly, fatigue modeling software and the calculation of roster metrics indicative of fatigue. The company has received dispensation to use a FRMS from U.K. Civil Aviation Authority after reporting the results of a six-month trial of the FRMS approach at two of their bases: A decrease in flight risk (1.8% to 0.7%) and flight deck error (mean error rate of 5.2/sector to 2.6/sector) and as a result, a decrease in attrition and insurance premiums. (Stewart, S. (2006). An Integrated System for Managing Fatigue Risk Within a Low Cost Carrier; Proceedings of the International Aviation Safety Seminar, Flight Safety Foundation, October 23-26, Paris, France)

- Case Study: French Regional Airlines

The STARE (Securite du Transport Aerien et gestion du Risque fatigue) project, run by the partnership of three French regional airlines, developed an FRMS with a bio-mathematical model predictive of fatigue, to benefit from a schedule with reduced rests, and rest time below the standard prescriptive requirements. Through the use of a bio-mathematic model (Fatigue Risk

Index), and a training and education program, the expansion of the HoS rules was approved (Cabon et al., 2011).

- Case Study: Queensland Transport, Australia

Queensland Transport was the first regulatory body to offer organizations exemption from hours of service regulation in exchange for a documentation of an effective FMP. There are now two types of FMP opt-out available, depending on the extent to which an organization can demonstrate that it can manage and audit fatigue in its employees (Mahon & Cross, 1999).

- Case Study: New Zealand Aviation

In aviation, New Zealand has the longest experience in the development of FRMS. In 1995, the regulations were altered so air operators could either comply with a standard prescriptive scheme or have alternative company specific scheme approved. (Cabon et al., 2008)

4. Prescriptive Work Hours Rules Alone are Not Sufficient

Prescriptive regulations or work hour mandates are increasingly being criticized for being an overly simple solution to a complex problem. They are straightforward but tend to be rigid and limit operational flexibility and efficiency. By themselves, work hour rules are inherently unsafe - they create an illusion that to operate within the limits is inherently safe and going outside the limits is inherently unsafe.

For example, simply reducing work hours under a prescriptive Hours of Service rule may not have the desired effect as is illustrated by the following case study:

- Case Study: Medical Resident Duty Hours

In July 2011, a reduction in the permitted duty hour limits was implemented for U.S. residency programs based on the recommendation of the Accreditation Council for Graduate Medical Education (ACGME).

However, a longitudinal cohort study comparing interns serving before (2009 and 2010) and interns serving after (2011) the implementation of the new duty hour requirements involving fifty-one residency programs at 14 university and community-based GME institutions (a total of 2323 medical interns) found adverse effects of reducing duty hours. Although interns reported working fewer hours under the new duty hour restrictions, this was not accompanied by an increase in hours of sleep or an improvement in depressive symptoms or well-being. Furthermore, this was accompanied by an unanticipated increase in self-reported medical errors.

5. CSB is Misinterpreting Section 4.8 Dealing with Consistently Working at the Hours of Service Limits is Not Sustainable and May Lead to Chronic Sleep Debt

The opinion expressed by CSB staff that Section 4.8 “has a serious internal contradiction and a lack of clarity in its requirements” is based on their failure to understand the FRMS approach to fatigue mitigation, and the added value provided by API RP 755 in meeting the underlying intent of the CSB recommendation. In fact, these API comments will show that there is no contradiction and that RP 755 provides a clearly defined and much more comprehensive approach to fatigue management.

The CSB staff who prepared the draft CSB evaluation appear not to understand the role of outer boundary Hours of Service limits within an FRMS and how they differ fundamentally from traditional hard Hours of Service rules, unsupported by other effective fatigue risk countermeasures.

When Hours of Service first evolved in between 1910 and 1950, fatigue was viewed as a simple hour glass problem. Alertness was presumed to dissipate over time and after a number of hours, the individual was rendered fatigued, and then needed a recovery period of a certain number of hours to become rested and fit for duty. What we now know from the revolutionary advances in circadian sleep science in the 1970-1990, is that the interactions of work hours and rest hours are far more complex because of the influence of circadian phase and other factors such as light exposure.

Instead of the check-the-box Hours of Service approach which provides a false assurance of fatigue mitigation, the FRMS approach requires an ongoing assessment of fatigue risk. It is driven not by simple rules, but instead by risk outcomes. One of the reasons for the failure of the hard rules HoS is that it encouraged managers to blindly follow the rules, and not bother to assess whether the rules were effective.

This would perhaps explain why CSB staff appears to be confused by the statement in RP 755 that “consistently working at the limits is not sustainable and may lead to chronic sleep debt.” They italicize this phrase in their comments and then re-quote it in the extract from the HSE statement, almost as though CSB staff think this is a weakness in RP 755, rather than the strength that it is.

Traditional hard-fixed Hours of Service rules had to be set with tighter boundaries because they were the only risk prevention barrier and had to allow for worst-case circumstances of increased risk. But they also created unnecessary inefficiencies in the use of valuable time, forcing operators to stop work when they were fully alert

and not able to sleep, and sometimes holding them back from working when they were fully rested. These unnecessary inefficiencies in the use of time cause companies operating under Hours of Service to respond by pushing operations to the limits of available hours under the rules. Because these hard HoS rules do not incorporate circadian sleep science, significant fatigue risk is created (as discussed in Section 3 above).

In contrast the FRMS approach:

1. Recognizes that fatigue is multi-factorial and non-linear.
2. Is well informed by circadian sleep science and takes advantage of the important contributions of other fatigue countermeasures.
3. Recognizes that trying to write prescriptive HoS rules that take all the complex interactions of all these factors including sleep efficiency within sleep opportunity windows, work timing within wake time, circadian phase and elapsed time into account would make any rule impossibly unwieldy.

The solution is to set outer boundaries that are sufficiently non-restrictive to allow for the full range of fatigue mitigation strategies to be implemented, but firm enough to prevent abuses of managerial discretion. The extensive use of the term “shall” in the Hours of Service limits requires the enforcement of these outer boundary limits.

For these Hours of Service outer boundary limits to be effective, a safeguard is provided using “shall” language to prevent these outer boundaries being used as an optimization target. Hence the warning that “consistently working at the limits is not sustainable and may not lead to chronic sleep debt” and the statement that the FRMS shall be designed to prevent employees operating consistently at these limits.

We would therefore agree with the UK-HSE quote that “consistently working at the limits is not sustainable and may lead to chronic sleep debt and would be unacceptable” in not just the UK but the U.S. as well. The part of the UK-HSE opinion we would question is their statement that rapid rotation of shifts is good practice. It is true that rapid rotating shifts (so-called “continental shift schedules”) are traditionally more common in Europe. However, more recent research now supports the North American view that rapidly rotating schedules create substantial fatigue and are definitely not “good practice.”

6. Why the FRMS Approach for Outages Allows for More Consecutive Shifts (14) than Normal Shifts (7) for 12-hour Shifts.

The RP 755 standard, unlike a government regulation, is intended to serve as a continuously improving process to manage the risk of fatigue in the refining and petrochemical industries based on accumulating data and experience. API standards are reviewed every five years or earlier if technology, experience and/or data suggests such action. RP 755 represents a significant voluntary advance in managing employees in the industry, and is addressing head-on many cultural factors and operating practices that have been in place for many years.

One challenging area is the staffing and scheduling of employees in outages. Operational considerations were part of the decision to allow longer work sets during outages, including the desire to minimize the length of outages and the availability of specialty contractors. However there are other scientific factors that suggest this can be acceptable.

- a) Workers adjust the lifestyles away from work thus they can plan for the outages.

A major determinant to an employee's fatigue is how he/she spends off-duty time. Other commitments including church, social, recreational and family activities have a large impact on sleep timing and duration and therefore fatigue. The operating experience from outages is that employees halt these other obligations for the limited period of the outage. They therefore become more like remote site operations, where sleep off-duty is treated as a priority.

- b) Workers are not flipping schedules (days to nights or vice versa)

During outages, industry experience is that employees work fixed shifts and do not rotate between day and night. Thus, the circadian disruptive effects of rotating sleep hours is reduced and it is easier to adjust circadian phase to support good quality sleep and improved alertness at work. Fatigue training programs which teach how to adjust circadian clocks are an added benefit of FRMS.

Many individuals who work night shifts during outages were queried regarding the optimal time off during an outage. The vast majority, including the representatives from local chapters of the USW, indicated that if they have a single shift off, they are likely to use it to obtain extra rest. However, longer periods of time off would tempt them to revert to being awake during the day and sleeping at night, in order to have more time with family and friends. Thus, they would actually be more fatigued upon resuming work on the night shift. For this reason, RP 755 provides the option of a 36-hour break between work-sets during outages.

To address the risks associated with start-up after an outage, there are provisions in RP 755 which establish that safety critical people are well rested.

Experience gained as RP 755 is implemented across the industry will indicate whether these assumptions are correct, and adjustments can be made as more experience and data becomes available.

Conclusion #4

RP 755 was based on science and practical/operational considerations using a FRMS approach which does allow for more permissive hours of service limits. Science and expert opinions support this conclusion.

Appendix A – Status of CSB Recommendations to API

2005-4-I-TX-2, Urgent

In light of the findings concerning the March 23rd incident at BP's Texas City refinery, revise your Recommended Practice 752, Management of Hazards Associated with Location of Process Plant Buildings or issue a new Recommended Practice to ensure the safe placement of occupied trailers and similar temporary structures away from hazardous areas of process plants. Ensure that the new recommended practice: - Protects occupants from accident hazards such as heat, blast overpressure, and projectiles; - Establishes minimum safe distances for trailers and similar temporary structures away from hazardous areas of process plants; - Evaluates the siting of trailers under a separate methodology from permanent structures, since trailers are more susceptible to damage, are more readily relocated, and likely do not need to be placed near hazardous areas.

Status: Closed - Acceptable Action (C - AA) - The recipient has completed action on the recommendation. The action taken meets the objectives envisioned by the Board.

2005-4-I-TX-3, Urgent

Issue a safety alert to your membership to take prompt action to ensure the safe placement of occupied trailers away from hazardous areas of process plants.

Status: Closed - Acceptable Action (C - AA) - The recipient has completed action on the recommendation. The action taken meets the objectives envisioned by the Board.

2005-4-I-TX-4

Revise API Recommended Practice 521, Guide for Pressure Relieving and Depressurizing Systems to ensure that the guidelines: - Identifies overfilling vessels as a potential hazard for evaluation in selecting and designing pressure relief and disposal systems; - Addresses the need to adequately size disposal drums for credible worst-case liquid relief scenarios, based on accurate relief valve and disposal collection piping studies; - Warns against the use of atmospheric blowdown drums and stacks attached to collection piping systems that receive flammable discharges from multiple relief valves and urges the use of appropriate inherently safer alternatives such as a flare system

Status: Open - Awaiting Response or Evaluation/Approval of Response (O - ARE/AR) - The recipient has not submitted a substantive response, or the evaluation by CSB staff of a response is pending, or the Board has not yet acted on staff recommendation of status.

In the case of API Recommended Practice 521, API submitted the revised standard on May 8, 2008, and received staff comments on May 13, 2011, which are being taken in consideration during the standards' regular 5 year review cycle.

2005-4-I-TX-6

Work together to develop two new consensus American National Standards Institute (ANSI) standards. a. In the first standard, create performance indicators for process safety in the refinery and petrochemical industries. Ensure that the standard identifies leading and lagging indicators for nationwide public reporting as well as indicators for use at individual facilities. Include methods for the development and use of the performance indicators. (CSB2005-04-I-TX-R6A) In the development of each standard, ensure that a. the committees are accredited and conform to ANSI principles of openness, balance, due process, and consensus; b. include representation of diverse sectors such as industry, labor, government, public interest and environmental organizations and experts from relevant scientific organizations and disciplines.

Status: Open - Acceptable Response or Alternate Response (O - ARAR) - Response from recipient indicates a planned action that would satisfy the objective of the recommendation when implemented.

In the case of API Recommended Practice 754, *Process Safety Performance Indicators for the Refining and Petrochemical Industries*, API submitted its response on May 28, 2010, and the CSB held a public meeting on July 22, 2012 and determined that the “American Petroleum Institute Has Made “Acceptable” Progress on Recommendation to Develop Process Safety Indicators for Onshore Industries” and that the “Board considers the API is moving in the right direction, but that more remains to be done to meet the intent of the recommendation”, CSB July 23, 2012 Press Release.

The one remaining recommendation to API is as follows:

2005-4-I-TX-7

Work together to develop two new consensus American National Standards Institute (ANSI) standards. b. In the second standard, develop fatigue prevention guidelines for the refining and petrochemical industries that, at a minimum, limit hours and days of work and address shift work. (CSB2005-04-I-TX-R7a) In the development of each standard, ensure that the committees a. are accredited and conform to ANSI principles of openness, balance, due process, and consensus; b. include representation of diverse sectors such as industry, labor, government, public interest and environmental organizations and experts from relevant scientific organizations and disciplines.

The CSB Staff has completed its review of API Recommended Practice 755, *Fatigue Risk Management System for Personnel in the Refining and Petrochemical Industries*, and is recommending to the Chemical Safety Board as “Open - Unacceptable Response (O - UR) - Recipient responds by expressing disagreement with the need outlined in the recommendation. The Board believes, however, that there is enough supporting evidence to ask the recipient to reconsider”, and then provides its reasoning in a document posted in the Federal Register on March 13, 2013.

Appendix B – Clauses that Remained in RP 755 After USW Departed the Standards Development Process

“For this reason, key stakeholders shall be consulted in developing and implementing the local application of the FRMS.”

- This was added to RP 755. USW proposed consultation on FRMS and after discussion, the consensus of the committee was to call for consultation for the local application.

“In order for this to be successful, a culture of fatigue management should be created in which the shared responsibility of mitigating risk is recognized, workers are comfortable in disclosing their personal sleep or fatigue status and seeking assistance is encouraged without fear of reprisal.”

- The USW initially proposed language that prevented discipline for reported excess fatigue. After discussion, the language above was agreed upon. It addresses the concern raised while not preventing being so prescriptive as to prevent appropriate actions if the FRMS is abused.

“These guidelines are intended for all employees working night shifts, rotating shifts, extended hours/days or call outs involved in process safety sensitive actions. They should also be considered for others making process safety-sensitive decisions.”

- Industry proposed the first sentence only. USW proposed expanding the scope to include all individuals making process safety-sensitive decisions. After discussion, the consensus of the committee was to add the second sentence.

“Individual Risk Assessment & Mitigation”

- The term “fitness for duty” was removed at USW’s request.

“Individuals who experience repeated bouts of excess fatigue should be referred to their health professional or medical department for further evaluation and advice regarding actions they can and should take to maximize their alertness.”

- “Counselling” was replaced with “advice” at USW’s request.

“Programs designed to identify and address sleep disorders should be offered”

- Initially, industry proposed language that called for these programs to be implemented. The USW was concerned that sleep disorder screening, diagnosis and treatment may be mandated. Thus they proposed that the programs should be “offered” rather than “implemented”

“Consistently working at the limits shown is not sustainable and may lead to chronic sleep debt. The overall FRMS shall be designed to prevent employees from frequently working at or near these limits over the long term. “

- While this was the original intent, explicitly stating this was at USW’s request.

“There shall be a minimum of 36 hours off after a work set. Any employee shall not be denied up to 48 hours off, if requested. Time off beyond 48 hours shall be addressed at the plant level.”

- The USW International representative wanted 48 hours. Other USW representatives and most of industry wanted 36 hours (see response to CSB Comment 4). The wording reflects a compromise to accommodate all views.

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RE: CSB request for public comment on Docket#CSB-13-01 of the evaluation of RP-755 by the CSB.

Honorable CSB Board Members;

My concern is Staffing and periodic review requirements or lack thereof as described in RP-755 and how I see it effecting PSM.

I am a member of USW local 7-517 workman's committee in Lemont, Illinois since 2006 and employed at the refinery since 1998, and in addition to our Local's official comment I would like to add a comment of my own.

The Industry seems to be trending towards a leaner work force and seems to want to cut staffing wherever they can. I say the Industry because at the Lemont, refinery our union workman's committee has objected to staffing reductions proposed and ultimately imposed by the Company despite our objections. The Company's position is that staffing reduction is what they need to do to remain competitive in today's industry. They seem to put a lot of stock in an "independent" consultant Solomon study to compare themselves with the rest of the industry, and this is one tool they use to make their determination of staffing levels. The Company constantly reminds us that they do not staff for emergencies.

Pre RP-755 staffing of units would be complemented by extra operators during high maintenance or High hazard work periods under what would be considered "normal operations" by posting overtime allowing at least one operator to be available to pay attention to these jobs while the normal operators could concentrate on the normal operation of the unit as well as the normal day to day activities. Post RP-755 has seen that the workload is being absorbed by the normal compliment of operators with no extra operator to assist leaving the normal compliment of operators to divide attention to operation of unit plus shut down & Lotto clear drain and de-pressure, pre-job safety meetings, CSE permitting or High hazard work going on. The company is using RP-755 as a reason to eliminate this overtime in the interest of fatigue; my guess is that any periodic review will not show a need for more staffing if this overtime is not posted and filled and documented.

I can only speak for my experience but it seems that CITGO at least is using this to eliminate necessary overtime during these high peak work times to keep from potentially finding out they need to put on more staffing during a periodic review, and as a result the need for the extra staffing doesn't go away it just goes into more stress on operators because of the increased workload and keeps the operator from giving proper attention to anything but a little attention to everything, which in my eyes is setting us up to fail due to an overload of responsibilities and very well may be a hidden or overlooked consequence of RP-755.

In addition we had a turnaround at our crude unit last year and it was the biggest one since RP-755 was published in 2010. Normal unit staffing found proper staffing lacking, even with double crews on 12hr shifts. The Company was pulling operators and management from other units in the refinery with little or no experience in the crude unit operation I believe it was referred to as an “all hands on deck” situation, I believe this is the one reason we had one of the worst Turnarounds ever as far as PSM goes and what I believe to be some very serious near misses. I don’t believe this is the forum to describe these incidents; however I will be attending the public meeting on the 24th if the board would like to hear about these incidents that cause me concern.

In addition to our negotiation woes as addressed in our official comment we tried and came up with a tentative agreement on pay and release for employees serving on safety committees, such as Joint health and safety, Safety Practice Standards, Safety Awareness and other committees as defined in OSHA PSM program, only to have the company withdraw the tentative agreement in the concern of creating overtime and possibly hitting HOS limitations per RP-755. I believe that our participation and input on these committees is crucial and each member should be allowed time for preparation and be in the best frame of mind to contribute to these committee meetings. Our initial tentative agreement did just that and was reached pre RP-755 and rejected by the Refinery leadership team post RP-755 because of fatigue concerns by the company.

Even though this is just my own personal comment I think it needs to be said that since our official Local comment was submitted CITGO did offer another proposal to our committee and stated quite clearly they intend to only deal with “Shall’s” in the RP-755 and not the “Should’s”. I believe it is important to include this, because I believe it is what the CSB was referring to in one of the posted proposed evaluations as a concern.

I want to say that all this is just my opinion as a unit operator and a concerned union member I have not consulted with anyone else on this comment. I feel strongly that this needs to be said and in summation it seems to me that RP-755 at our location is being used to eliminate necessary overtime in order to ensure that periodic reviews do not show the need for more staffing, and increased workloads on operators due to lack of extra help will increase the chance of an incident regardless of the amount of hours someone puts in. RP-755 does in fact stress the importance of adequate staffing levels and to not just deal with HOS limits but it falls short in the requirements such as training, utilization of time off, proper evaluation of staffing levels by all stakeholders. I can honestly say that my own personal experience fatigue is not necessarily a consequence of how much time I spend at work as much as it is on how much time I have away from work before returning.

I really hope the board votes to accept the proposed evaluations, and the API and USW agree to accept the CSB evaluations and agree to review prior to 2015 with the intention of re-writing RP-755.

Sincerely & Respectively;

David Handkins
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(815) 600-4830



Jeffery Hazle
Senior Director
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April 12, 2013

CSB Docket Office
Docket CSB-13-01, Fatigue Comments
Chemical Safety and Hazard Investigation Board
By email: fatiguecomments@csb.gov

Attn: Amy McCormick
2175 K Street, NW, Suite 650
Washington, DC 20037

RE: Request for Comments on CSB Draft Evaluation of the Recommended Practice for Fatigue Risk Management Systems for Personnel in the Refining and Petrochemical Industries

AFPM appreciates the opportunity to provide the following comments on the United States Chemical Safety Board (CSB) staff's Draft Evaluation of the Recommended Practice for Fatigue Risk Management Systems for Personnel in the Refining and Petrochemical Industries.

AFPM, the American Fuel & Petrochemical Manufacturers, is a trade association representing high-tech American manufacturers of virtually the entire U.S. supply of gasoline, diesel, jet fuel, other fuels and home heating oil, as well as the petrochemicals used as building blocks for thousands of vital products in daily life. AFPM members make modern life possible and keep America moving and growing as they meet the needs of our nation and local communities, strengthen economic and national security, and support 2 million American jobs.

AFPM and its members supported CSB's recommendations from BP Texas City on both the development of process safety metrics and guidelines for managing fatigue risks. On August 5, 2009, AFPM President Charles Drevna wrote to the CSB to affirm our organization's commitment (attachment). We believe that the development of these two recommended practices will have a positive impact on safety in the petroleum refining and petrochemical manufacturing industry.



AFPM and its member companies participated in the committee that developed the API RP 755 Fatigue Management Systems recommended practice. As directed by the CSB recommendation, this committee's work was conducted in accordance with procedures established by the American National Standards Institute (ANSI) that require balance, consensus, and due process. AFPM and its members appreciated the strict requirements and transparency made possible through the ANSI process. The document received final ANSI approval in April 2010 indicating that API followed the requirements of the approved standard development process.

Over the past three years RP 755 has been used by many AFPM members who have expended substantial effort developing fatigue risk management policies. To support our members, AFPM has held monthly teleconferences since January 2011 to facilitate the exchange of information and held a one-day workshop in September 2012 where members were able to discuss with each other and with fatigue management experts ways to approach implementation of RP 755. AFPM members are presently in various stages of implementing RP 755 at their facilities.

AFPM disagrees with CSB's draft evaluation statement which says "The document lacks explicit requirements in the form of "shall" language for the essential elements of an effective fatigue management system." On the contrary, RP 755 contains numerous "shall statements" which establish a framework for a fatigue risk management policy. That framework of explicit minimum requirements is supplemented by numerous "should statements" which provide additional guidance for implementation while allowing flexibility to accommodate site-level circumstances such as differences in labor agreements, site work culture, and type of facility.

AFPM believes that RP 755 appropriately uses a hierarchy of requirements where 1st order minimum requirements (shall statements) are supplemented by 2nd order requirements (should statements) that allow facilities to implement the RP in a way that is most effective for their circumstances and still protective of employee safety.

In conclusion, AFPM believes that the development of RP 755 under ANSI-approved procedures and its publication as an American National Standard satisfies the 2005 CSB recommendation. Therefore, it would be inappropriate for the CSB to deem the



recommendation to be "Open - Unacceptable Action" (i.e. "recipient responds by expressing disagreement with the need outlined in the recommendation...") since industry has not disagreed with the need to manage fatigue risk. Rather, it would be more appropriate to view the industry response as "acceptable" and deem the recommendation to be "Closed - Acceptable Action."

Sincerely,

Jeff Hazle
Senior Director, Refining Technology
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Charles T. Drevna
President



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August 5, 2009

The Honorable John S. Bresland
Chairman and Chief Executive Officer
U.S. Chemical Safety Board
2175 K Street NW, Suite 400
Washington, DC 20037

Dear Chairman Bresland:

NPRA, the National Petrochemical and Refiners Association, is writing today to express its continued support for the CSB recommendations to API and United Steel Workers (USW) listed in its final report on the 2005 BP America Refinery Explosion (2005-4-1-TX-6 and 2005-4-1-TX-7) released March 2007. NPRA members include more than 450 companies, including virtually all U.S. refiners and petrochemical manufacturers. The protection of our workers, our contractors and our neighborhoods is paramount. As a result, NPRA member companies have invested significant resources to address the lessons from the CSB report.

NPRA and its member companies are stake-holders and active participants in the API RP 754 Process Safety Indicators and the API RP 755 Fatigue Management Systems standards development workgroups. We regret the decision by the USW to withdraw from this important undertaking to advance the safety of workers in the refining and petrochemical industries. As directed by the CSB recommendation, these workgroups are being conducted in accordance with procedures established by the American National Standards Institute (ANSI). These procedures require balance, consensus and due process. NPRA strongly believes in the transparency of this process and that these standards procedures will improve the safety of the refining and petrochemical industries.

A Fatigue Management Standard is an important step to ensure the safety of the employees, contractors, and neighborhoods. NPRA members believe that in order to enhance safety practices at facilities, it is necessary to include a review of employee shift work. Through participation in the API RP 755 workgroup, stakeholders successfully achieved consensus on many fatigue issues. NPRA will continue to work diligently with the rest of the stakeholders on the standard.

For more than 30 years, NPRA has collected Occupational Injury & Illness data in accordance with OSHA record keeping requirements. During that time, occupational safety incident rates have consistently declined. NPRA anticipates the Process Safety Indicators Standard will advance improvement as it has in occupational safety. NPRA member companies recognize this process will provide them the opportunity to attain a unified definition of a Process Safety Event that will enable them to set performance targets and benchmark across industry. We are hopeful that the API RP 754



Page 2

August 5, 2009

standard is completed by the fourth quarter of 2009 in order to allow NPRA members to report data beginning January 2010. NPRA anticipates its collection of this data will ultimately result in improved worker safety.

NPRA commends the CSB on its recommendations for the improvement of safety in the workplace. We are confident that the results of these efforts will have a significant and positive impact on industry.

Please feel free to contact me with any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "C. Drevna", is placed over a light gray rectangular background.

Charles T. Drevna
President

cc: Daniel M. Horowitz, Ph.D, Director, Office of Congressional, Public, and Board Affairs, U.S.
Chemical Safety Board

From: ROBERT HELTZEL [bobheltzel@sbcglobal.net]
Sent: Friday, April 12, 2013 3:38 PM
To: fatiguecomments
Cc: jennifer.bailey@hypertechs.com
Subject: Fw: Docket Number CSB-13-01, Comment on Fatigue Risk Management Systems

To Whom It May Concern at CSB:

Please delete my previous comment submission and use this submission below instead. I just noticed an operative word missing in one of my sentences that completely changed the context of the statement and I would really prefer that it be corrected to reduce confusion.

Thank you for understanding and helping me correct my mistake!

Best regards,
Robert L Heltzel, CSP

----- Forwarded Message -----

From: ROBERT HELTZEL <bobheltzel@sbcglobal.net>
To: fatiguecomments@csb.gov
Cc: jennifer.bailey@hypertechs.com
Sent: Fri, April 12, 2013 2:25:57 PM
Subject: Docket Number CSB-13-01, Comment on Fatigue Risk Management Systems

RE: Chemical Safety & Hazard Investigation Board Docket Number CSB-13-01, Fatigue Risk Management Systems

To Whom It May Concern:

Attached are my comments on the draft evaluation of the actions taken by the API and USW to implement the CSB recommendation for fatigue prevention, more specifically the development of fatigue risk management systems (FRMS). Please include my comments in the docket as an interested and concerned stakeholder.

Comment on any aspect of the draft CSB analysis summarized in the document.

After reading through API RP 755, as well as the Technical Report 755-1 support document, I feel a consistent theme permeated both documents in that the stakeholders who authored the document are not thoroughly convinced that the science behind human biological clocks, sleep deprivation and circadian rhythms is precise and factual. Or to put it in other terms, I believe the authors are reticent to try to impose specific regulations on employers mandating they develop specific guidelines on how they are to manage supervisors' and workers' sleep and social patterns to ensure workers are fully rested before starting their shifts. API RP 755 is rife with "should" statements instead of "shall" or "must" statements, therefore I'm fairly certain that many industry stakeholders will, for the most part, ignore the requirements or interpret them as mere suggestions, and possibly 'water-down' the level of priority and passion needing to be given to this recommended practice.

Being a stakeholder with HES technical safety responsibilities for Chevron's MidContinent Business Unit, including having a direct report that manages our Risk Management efforts and interfaces daily with our Process Safety Management (PSM) department, I have a passion around fatigue management and have emphasized this hazard category in each of our Risk Management and hazard assessment IHAZID initial and

revalidation efforts. Although we have not reached a level of consistency and program continuity that could be considered a comprehensive “Fatigue Risk Management System” in our Upstream operations, where most of our natural gas processing plants are grouped, we DO have relatively robust FMRS efforts going on in our Downstream refineries, such as our Pascagoula, MS and Richmond, CA facilities, which are two of the largest refineries in the United States.

All of our refineries have websites dedicated to giving both our Chevron workforce and contractors advice and counsel on managing their off-duty lives so that their safety will not be compromised while ON-duty. Newsletters are published weekly at both facilities and posted on their websites, blogs have been established so plant operators and supervisors can interact and discuss issues, and in my opinion, the vast majority of the components of an effective FMRS are being embraced at those facilities and a robust outreach program for contractors is being maintained as well. However, I feel we still have not done enough at our Upstream natural gas processing plants as of yet and I plan on continuing to push our Operational Excellence leadership team to incorporate many of the best practices in API RP 755 into our PSM facilities’ cultures.

Comment on whether RP 755 is consistent with the CSB recommendation that triggered it.

Being a stakeholder in the petroleum industry, I feel that my view points may be slanted somewhat, but I honestly do believe that most of the super-major and major oil companies that have both Upstream and Downstream operations realize that fatigue DOES impact the decision-making and actions of their workforce and is an important safety issue that must be addressed. However, having worked in this industry for over 25 years, I also know that MOST of the smaller, independent companies will not spend the time and money, nor make an effort to embrace the requirements of a consensus standard. To drive positive changes in these independent oil companies’ cultures, fatigue management is going to have to be championed by regulatory agencies and codified as law before it’ll get their attention, and even then, I believe many will not comply and, instead, will take their chances of getting caught versus putting an effective FRMS in place.

I advocate a push by the CSB to actively lobby OSHA to incorporate robust fatigue prevention language into their PSM standard (29 CFR 1910.119) and mandate specific hours of service, and going even further, set specific guidelines around fatigue, biorhythm and circadian rhythm outreach efforts. Unfortunately, I don’t think the guidelines in API RP 755 go far enough in explaining how a fatigue management program should be developed and managed, and the authors put far too much accountability on supervisors and employees to “self-police” and maintain vigilance as opposed to driving employers to use technological advances in fatigue management to reduce risk and enhance their safety cultures.

Comment on any other relevant aspect related to RP 755 and the management of fatigue risk in the refinery and petrochemical industries.

Under section 4.6, *Individual Risk Assessment and Mitigation*, the “shall” statement regarding companies encouraging individuals to be alert to their fatigue status is a bit ludicrous, although our Chevron MidContinent Business Unit DOES do this on a daily basis during job safety analysis and hazard analysis activities before each job in our natural gas processing plants. I believe any corporation in a high-hazard industry such as ours touches on multiple best-practice issues every day during pre-job JSAs, such as inattention blindness to hazards while both working AND while driving to and from job locations, paying attention to behaviors of employees to look out for evidence of both legal and illegal substance abuse, etc., however, every company reaches a saturation point where we can’t cover every topic, every day. We

incorporate a “hazard identification” wheel with hazardous energies to lead discussions before jobs, as well as a Preventing Serious Injuries & Fatalities (PSIF) engagement process (which includes fatigue management, by the way) to ensure all workers converse on the high risk, high energy hazards associated with the jobs to enhance awareness and reduce complacency.

Chevron also has a robust “Stop Work Authority (SWA)” process that is a part of our culture, and I can cite many instances where employees AND contractors have used SWA on themselves without fear of repercussion because of fatigue, heat stress conditions, even inattention due to family matters that are bothering the employees so much they cannot focus on the job at hand. However, I don’t feel the majority of smaller, independent upstream companies operating natural gas processing plants have safety cultures that have evolved to this level of sophistication or “standard of care” as many of the super-major and major O&G production companies, and I honestly don’t think the leadership teams at these independent producers are ready to accept this fatigue management effort as a priority for their companies.

Being a supervisor, an issue I have with the aforementioned Section 4.6 around supervisors having to monitor the conditions of employees and “ensuring employees are alert enough to safely perform their work” is that in our industry, that level of oversight is very difficult to achieve. In our Business Unit’s situation, our natural gas processing plants (all PSM facilities) are usually in relatively remote areas sometimes 50 – 100 miles away from populated areas, so supervisors are not policing each and every employee every minute of the work day. We do have lead operators, however, that DO interface with other operators on their shifts (which are usually 10 hr. or 12 hr. shifts), and so, even though they seldom have a supervisory relationship with the other operators, these lead operators have a vested interest in paying close attention to the fatigue condition of their fellow operators. If an abnormal or upset condition develops into a catastrophic event, it may be 30 minutes to an hour before any emergency response can be expected; therefore, it’s in ALL of the plant operators’ best interests to be fully attentive and well-rested so as to make the best decisions.

Our Incident Investigation & Review (IIR) group DOES have a root cause questionnaire developed around human performance and fatigue, although a few of the factors in section 4.7, *Incident/Near Miss Investigation* are not covered in their checklist. Chevron has the resources to manage this data, but I seriously doubt that smaller, independent producers or gas plant operators will incorporate this incident investigation procedure into their arsenal of incident prevention techniques, and I know for a fact that getting most smaller businesses in our industry to track near misses is difficult at best. But, it is yet another ‘should’ statement, so this may be a moot point.

We have established hours of service limits at our natural gas processing plants, with limits of no more than 12 hrs. per shift, although several of our gas plants have an exception process in the event of a turnaround or emergency/deviance whereby the next shift cannot make it out to the remote site where our gas plants are located. These situations would fall under 4.8.1.3, *Extended Shifts* in API RP 755. Each gas plant actually has cots and a “quiet room” for napping during these exception time frames, however, I feel they’re not monitored anywhere near as closely as they should. I also believe the hours of service requirements are necessary and feel that even we super-major oil companies do not define the conditions around exceptions, outages, and other deviations well enough, nor do we meet the “continual improvement” aspects of the recommended practice.

I think these “hours of service” recommendations from API RP 755 are guidelines that the oil and gas industry will begin to see OSHA’s use of in 5(a)(1), or General Duty Clause, situations in future petrochemical and refinery process upset investigations. Therefore, it makes sense to me that the CSB use every tool at their disposal to move this onto OSHA’s agenda of proposed rulemaking to possibly modify 2 CFR 1910.119, the Process Safety Management standard, and incorporate these recommendations into a codified format. I personally believe it will take codification into law to make these necessary components of a comprehensive

Fatigue Risk Management Systems become an accepted cultural change that the oil and gas industry will have to accept. I am NOT speaking for Chevron Corporation in making these statements, instead just as a safety professional that has unfortunately learned that in the O&G industry, the low road is typically taken until the industry is forced through legislation to comply with a higher standard. I'm proud that Chevron has embraced FRMS and is moving forward with it in our refineries, albeit more slowly in our Upstream operations. But in my opinion, the vast majority of small independent O&G producers and petrochemical companies have done little to nothing to protect their workers from the dangers of fatigue and ultimately will have be forced to do what's in the best interest of the health and safety of their workers.

Sincerely,

Robert L. Heltzel, CSP
12214 E. County Road 101
Midland, TX 79706



National Transportation Safety Board

Washington, D.C. 20594

APR 23 2013

Office of the Chairman

US Chemical Safety and Hazard Investigation Board
2175 K Street NW
Suite 650
Washington, DC 20027

Attention: Ms. Amy McCormick—Re Comment on evaluation and proposed disposition of Recommendation No. 2005-04-I-TX-7.

Dear Madam:

On March 11, 2013, the US Chemical Safety and Hazard Investigation Board (CSB) published a request for public comment on a document released on its website titled “Draft Recommendations Evaluation for Public Comment: Fatigue Risk Management Systems (FRMS)” (CSB Evaluation). Subsequently, CSB staff invited the National Transportation Safety Board (NTSB) to share its experiences in investigating transportation accidents in which human fatigue was identified as a safety issue, and related NTSB safety recommendations.

The NTSB is an independent federal agency charged with determining the probable cause of transportation accidents and issuing safety recommendations aimed at preventing future accidents. The NTSB has a long history of making recommendations to reduce fatigue and fatigue-related transportation accidents and, since its inception, has issued over 200 recommendations addressing fatigue in the aviation, highway, marine, railroad, and pipeline modes. We are pleased to share our experiences with the CSB.

The CSB Evaluation comments on actions taken by the American Petroleum Institute (API) and the United Steelworkers International Union (USW) in response to Recommendation No. 2005-04-I-TX-7, issued by the CSB in 2005 to those organizations. The CSB recommendation was issued as a result of the March 23, 2005, Texas City, Texas, refinery explosion and fire. The portion of the CSB recommendation pertinent to this letter reads as follows:

[D]evelop fatigue prevention guidelines for the refining and petrochemical industries that, at a minimum, limit hours and days of work and address shift work....

In April 2010, the API issued an American National Standards Institute-approved Recommended Practice titled *Fatigue Risk Management Systems for Personnel in the Refining and Petrochemical Industries, First Edition* (RP-755), and an accompanying technical report titled *Fatigue Risk Management Systems for Personnel in the Refining and Petrochemical Industries, Scientific and Technical Guide to RP-755*. The CSB Evaluation presents the results of a CSB staff review in which the CSB staff determined that RP-755 does not meet the intent of the CSB recommendation in several areas.

The NTSB has reviewed RP-755 as well as the CSB Evaluation. With respect to human fatigue, the NTSB has specific experience with the following issues that are discussed in the CSB Evaluation:

- The hours-of-service limits described in RP-755, which are more permissive than what is indicated by current scientific knowledge, and the suggestion that voluntary FRMS programs will compensate for the risk from excessive hours and days at work, and
- The emphasis of RP-755 on voluntary efforts by industry and its lack of explicit requirements, especially with respect to elements of an effective fatigue management system.

With respect to the hours-of-service limits, RP-755 describes “work sets”¹ during normative conditions, which may include 12-hour day shifts or night shifts for 7 consecutive days, with the possibility of an additional “holdover period” beyond the duty day for training or safety meetings. The RP states that the “holdover period should not exceed 2 hours and, where possible, occur at the end of the day shift.” However, the use of the language “should” is not a requirement but is defined by the document as a “recommendation or that which is advised but not required in order to conform to the RP.”² Therefore, a worker could, during a normal work set, work shifts of 14 hours or greater in a 24-hour period for several days.

RP-755 also states that during planned or unplanned outages, workers may be called on to work 12-hour shifts for up to 14 consecutive days, with as little as 36 hours between 14-day, 12-hour work sets. Holdover periods of up to 2 hours are also allowed during outages. The RP also has provisions for extending work shifts up to 18 hours.

In several of its accident investigations, the NTSB has recognized the relationship between long duty days and fatigue, both directly and through their effects on reduced sleep lengths during off-duty periods.³ For example, in the investigation of the October 2004 Corporate Airlines accident in Kirksville, Missouri, the NTSB determined that the probable cause of the accident was the pilots’ failure to follow established procedures and properly conduct an instrument approach at night, and that fatigue was one factor that contributed to the pilots’ degraded performance.⁴ The length of the pilots’ duty day (at the time of the accident, they had been on duty for 14 1/2 hours) was cited along with less-than-optimal overnight rest time, early reporting time for duty, the number of flight legs, and demanding flight conditions, as

¹ RP-755 defines “work set” as consecutive shifts with a minimum of 36 hours off before starting another work set.

² The term “shall” is used in the RP to denote a minimum requirement in order to conform to the RP.

³ (a) National Transportation Safety Board, *Collision with Trees and Crash Short of the Runway, Corporate Airlines Flight 5966, BAE Systems BAE-J3201, N875JX, Kirksville, Missouri, October 19, 2004*, AAR-06/01 (Washington, DC: National Transportation Safety Board, 2006). (b) National Transportation Safety Board, *Runway Overrun During Landing, Pinnacle Airlines, Inc., Flight 4712, Bombardier/Canadair Regional Jet CL600-2B19, N8905F, Traverse City, Michigan, April 12, 2007*, AAR-08/02 (Washington, DC: National Transportation Safety Board, 2008). (c) National Transportation Safety Board, *Aviation Safety in Alaska*, SS-95/03 (Washington, DC: National Transportation Safety Board, 1995). (d) National Transportation Safety Board, *Collision of Two Canadian National Railway Freight Trains Near Two Harbors, Minnesota, September 30, 2010*, RAR-13/01 (Washington, DC: National Transportation Safety Board, 2013).

⁴ For the full probable cause statement and additional details about the accident, see AAR-06/01.

factors that resulted in the pilots' fatigue. In the Kirksville report, the NTSB cited research showing that pilots who worked schedules that involved 13 or more hours of duty time had an accident rate that was several times higher than that of pilots working shorter schedules,⁵ and that airplane captains who had been awake for more than about 12 hours made significantly more errors than those who had been awake for less than 12 hours.⁶ As a result of the Kirksville investigation, the NTSB issued Safety Recommendation A-06-10⁷ to the Federal Aviation Administration (FAA), which stated the following:

A-06-10

Modify and simplify the flight crew hours-of-service regulations to take into consideration factors such as length of duty day, starting time, workload, and other factors shown by recent research, scientific evidence, and current industry experience to affect crew alertness.

The NTSB reiterated Safety Recommendation A-06-10 in 2008 following its investigation of the April 2007 Pinnacle Airlines accident in Traverse City, Michigan. In that accident, the NTSB determined that the probable cause of the accident was the pilots' poor decision-making as they prepared to land the airplane. The NTSB stated that "This poor decision-making likely reflected the effects of fatigue produced by a long, demanding duty day and, for the captain, the duties associated with check airman functions."⁸ The pilots had been on duty for more than 14 hours at the time of the accident.

The effectiveness of fatigue management is directly related to the availability of work schedules that allow a sufficient period of time between work shifts for the employee to obtain sufficient restorative sleep. The NTSB has investigated several accidents and serious incidents that provided clear and compelling evidence that air traffic controllers were sometimes operating in a state of fatigue because of their work schedules and poorly managed utilization of rest periods between shifts, and that fatigue had contributed to controller errors. Consequently, the NTSB issued Safety Recommendation A-07-30 to the FAA, which stated the following:

A-07-30

Work with the National Air Traffic Controllers Association to reduce the potential for controller fatigue by revising controller work-scheduling policies and practices to provide rest periods that are long enough for controllers to obtain sufficient restorative sleep and by modifying shift rotations to minimize disrupted sleep patterns, accumulation of sleep debt, and decreased cognitive performance.

⁵ Goode, J.H., "Are Pilots at Risk of Accidents Due to Fatigue?," *Journal of Safety Research*, 34 (2003): 309–313.

⁶ National Transportation Safety Board, *A Review of Flightcrew-Involved Major Accidents of US Carriers, 1978 Through 1990*, NTSB/SS-94/01 (Washington, DC: National Transportation Safety Board, 1994).

⁷ Safety Recommendation A-06-10 superseded Safety Recommendation A-99-45 to the FAA to "Establish, within 2 years, scientifically based hours-of-service regulations that set limits on hours of service, provide predictable work and rest schedules, and consider circadian rhythms and human sleep and rest."

⁸ For the full probable cause statement and additional details about the accident, see AAR-08/02.

The NTSB's consideration of how long duty days affect fatigue and safety has not been limited to the aviation mode. Recently, in our investigation of the September 2010 collision of two freight trains near Two Harbors, Minnesota, the NTSB concluded that crew fatigue was a contributing factor in train crew errors that led to the collision. The train crewmembers who made the errors had been awake between 13 and 14 hours at the time of the accident, and the accident occurred during the final hour of a 12-hour shift.⁹ In its report, the NTSB cited a study showing that 12-hour work shifts have been associated with decrements in alertness and performance, compared to 8-hour shifts.¹⁰ Other studies of commercial drivers have found an exponential increase in crash risk with increasing driving times, especially for driving periods that extend beyond 8 or 9 hours.¹¹

The NTSB has made numerous recommendations concerning hours of service across the transportation modes.¹² A common theme of those NTSB recommendations has been an emphasis on establishing hours-of-service limits that are scientifically based, that set limits on hours of service, that provide predictable work and rest schedules, and that consider circadian rhythms and human sleep requirements.

The second issue discussed in the CSB Evaluation with which the NTSB has experience concerns the lack of explicit requirements regarding essential elements of a fatigue management program. The CSB Evaluation remarks that

The use of the word 'should' for most elements of a Fatigue Risk Management System (FRMS) in the RP means that they are optional, not required. In what is already a voluntary standard to begin with—employers can choose to conform to them, but they are not required by force of law to do so—'should' statements have very little force.

The lack of required FRMS elements raises additional concerns because RP-755 states that its hours-of-service limits were “developed in the context of the existence of a comprehensive FRMS” and that “Consistently working at the limits shown is not sustainable and may lead to chronic sleep debt.” Hence, while RP-755 does not require the use of an FRMS, it does ostensibly allow operators to persistently schedule workers at the noted limits.

The NTSB has recommended requiring the implementation of fatigue management programs. For example, as a result of its investigation of a June 2009 multivehicle accident near

⁹ For the full probable cause statement (including the contributing causes) and additional details about the accident, see RAR-13/01.

¹⁰ Rosa, R.R., M.J. Colligan, and P. Lewis, “Extended Workdays: Effects of 8-Hour and 12-Hour Rotating Shift Schedules on Performance, Subjective Alertness, Sleep Patterns, and Psychosocial Variables,” *Work and Stress* 3(2) (1989): 21–32.

¹¹ (a) Jovanis, P.P., K.F. Wu, C. Chen, “Effects of Hours of Service and Driving Patterns on Motor Carrier Crashes,” *Journal of the Transportation Research Board*, 2231 (2012):119–127. (b) Lin, T.D., P.P. Jovanis, and C.Z. Yang, “Time of Day Models of Motor Carrier Accident Risk,” *Transportation Research Record* 1467 (Washington, DC: Transportation Research Board, 1994) 1–8.

¹² For example, see NTSB Safety Recommendations I-89-3, I-99-1, P-99-12, R-99-2, R-06-3, M-99-1, M-11-20, H-99-19, A-99-45, A-06-10, and A-13-1.

Miami, Oklahoma,¹³ in which a truck driver's fatigue resulted in his failure to react to and avoid colliding with a slowing traffic queue, the NTSB emphasized the importance of comprehensive fatigue management programs. The report described the North American Fatigue Management Program (NAFMP),¹⁴ which is designed to address scheduling policies and practices, fatigue management training, sleep disorder screening and treatment, and fatigue-monitoring technologies. In the report, the NTSB stated that "if the NAFMP guidelines remain voluntary—and are used by some carriers but ignored by others—this important safety tool might have only a limited effect in reducing fatigue-related highway accidents." As a result of its investigation, the NTSB called on the Federal Motor Carrier Safety Administration to implement the following NTSB safety recommendation:

H-10-9

Require all motor carriers to adopt a fatigue management program based on the North American Fatigue Management Program guidelines for the management of fatigue in a motor carrier operating environment.

The NTSB has also made recommendations in the highway, railroad, and aviation modes to establish ongoing programs to evaluate, report on, and continuously improve fatigue management programs implemented by operators (NTSB Safety Recommendations H-08-14, R-12-007, A-06-11, and A-08-45).

I hope that this information about the NTSB's history of investigating fatigue-related accidents and the recommendations we have issued will be useful as the CSB moves forward with the evaluation of the API and USW responses to the fatigue-related CSB recommendation resulting from the Texas City investigation.

Sincerely,

A handwritten signature in black ink, appearing to read 'DAH', with a long horizontal line extending to the right.

Deborah A.P. Hersman
Chairman

¹³ For the full probable cause statement and additional details about the accident, see National Transportation Safety Board, *Truck-Tractor Semitrailer Rear-End Collision Into Passenger Vehicles on Interstate 44, Near Miami, Oklahoma, June 26, 2009*, HAR-10/02 (Washington, DC: National Transportation Safety Board, 2010).

¹⁴ See A. Moscovitch and others, *Development of a North American Fatigue Management Program for Commercial Motor Carriers: Phase II (Pilot Study)*, TP 14828E (Ottawa, Ontario: Transport Canada, January 2006) vii–xvi.



Lemont Local 7-517
Michael P. Hendry, President
35260 Grant Avenue
Custer Park, Illinois 60481

March 25, 2013

U.S. Chemical Safety and Hazard Investigation Board
2175 K Street NW
Washington, DC 20037

Re: **Application of API RP755 CSB-13-01**

Honorable CSB Members:

USW Local 7-517 represents three facilities engaged in the petroleum industry. As of this writing, only one is involved in USW's National Oil Bargaining Policy, and has thus been pressed to negotiate a Fatigue Risk Management System (FRMS) to be applied and implemented per the American Petroleum Institute's (API) Recommended Practice 755 (RP-755). As a point of reference, please consider that at the affected location (CITGO Petroleum Lemont Refinery), there are Operations workers on three distinctly different rotating 8-hour shift schedules, Laboratory workers on a 12-hour rotating shift schedule, and Maintenance workers on a general Monday-Friday 8-hour non-rotating shift schedule.

The refinery operates in the state of Illinois, which has a statute limiting the number of consecutive days that may be worked. The state law, 820 ILCS 140/1, enacted in 1935, and commonly known as ODRISA (for One Day Rest In Seven Act), provides that employers may not allow employees to work all seven days in a calendar week without obtaining a permit from the state allowing such, and then may allow only voluntary work hours on that day. In addition, the Collective Bargaining Agreement (CBA) has provided (since 1993) that employees who have worked three consecutive 16-hr hour shifts may not be forced to work a fourth. Granted, working three consecutive 16-hour shifts in today's context is not considered to be the safest of prospects; the point is that between the Illinois ODRISA and the CBA, we have been ahead of the national curve on mitigating fatigue for at least 78 years.

When it became known that the publication of API's RP-755 was on the horizon, it was acknowledged from both the Company's and the Union's perspectives that there were probably some additional measures we could come to agreement on which would contribute toward safer and healthier working conditions. The parties agreed to bargain mid-term over such changes, using RP-755 as a guideline. Several meetings were convened and proposals exchanged, yet no agreement was reached prior to the expiration of the 2009-2012 CBA, and the most recent (2012-2015) USW/Oil Industry NOBP Settlement. During negotiations we had been bargaining a Fatigue Risk Mitigation System as a Local issue, and were seeing progress toward resolution of the matter when the NOBP settlement was reached, effectively ending our efforts. We continued negotiating and concluded our remaining Local issues, and subsequently ratified the NOBP settlement at our location, along with the other Local contractual modifications that had been agreed to for the period of 2012-2015. The parties agreed to resume negotiations to apply and implement RP-755 at a later convenient date.

When we resumed, it seemed that the parameters we had to work within had changed

drastically. This being attributable to the NOBP settlement language: "The Parties agree to meet and discuss as soon as practicable, but no later than sixty (60) days from the ratification of this agreement, the application and implementation of this RP. The Parties will fulfill any bargaining obligations, where necessary, in connection with the implementation of the new RP, including changes to the existing contract language. It is agreed and understood that both Parties will provide support and cooperation to ensure successful implementation of the new RP." Prior to the agreement on this specific language, we had been taking a more common-sense approach to the issue of worker fatigue, from the standpoint of making changes that could be applied in consideration of our specific schedules and work practices.

Having read and re-read both the RP and the TSD, we believed we had come upon a way to read and apply the documents in a manner that accomplished the goal of preventing worker fatigue. We had questions we would have liked to ask of the API Board, and we attempted to call several times, leaving messages and receiving no call-backs, and then finally, following directives from the RP-755 documents ("All questions must be submitted in written form..."), we submitted them in writing in August of 2011. We have not received any answers to our questions to this date.

After some research we have found that we are one of only a small group of U.S. refineries still working 8-hr shift schedules in the United States. We have identified what we believe to be a bias toward 12-hour work schedules, such as the required a minimum 36-hrs off after a work set, regardless of 8-, 10- or 12-hr work schedules; 36-hrs being equal to 3x12, or 3 shifts off. The RP itself is very vague in several respects, such as a definition of the term "consecutive". In our opinion, "consecutive" means -on an 8-hr schedule- anything less than 16-hrs off, whereas, the Company interprets the RP as -anything less than 36-hrs off is "consecutive".

It seems likely that this may be due to the fact that API hired Circadian to do the scientific research and assemble data. It is well known that Circadian has a vested interest in 12-hr work schedules and offers services for hire to help companies transfer over to 12-hr shifts. We were further appalled, but not surprised, that API had also allowed Circadian to have voting power in the matter of developing RP-755.

We re-entered into bargaining over FRMS with CITGO on 9/14/2012. After an opening salvo from the Company, which followed RP-755 chapter-and-verse, we made a creative attempt to comprehensively address the issues of managing the risk of fatigue while preserving most of the contract and overtime provisions we have worked to gain and hold over so many decades.

One of the main disputes between the Union and the Company is the interpretation of how to handle open shifts on an 8-hr schedule. The Company insists that API did not intend for 16-hr shifts to be worked except on an unplanned basis, or an "extended shift" (as defined and explained in the RP & TSD). This has no rational standing, as it makes no sense to posit that a person would not be better off knowing in advance that they were going to work 16-hrs, such as in the case of signing for an "open shift" (as defined in the RP) or a making a shift trade in order to gain more time away from work. In the majority of cases, one who is afforded the ability to make these choices and plan their scheduled work time and off-time, will be better rested and prepared to work without suffering from fatigue. When taking into account the demographics of the refinery workers' lifestyles and distances between work and home, there is more support for allowing 16-hours to be worked, with sufficient time away from work, rather than requiring employees to report to work for "overtime blocks of 4-hrs". This is what occurs when cookie-cutter methodology is used to apply 12-hr workers' standards to 8-hr schedule workers.

In developing our proposal, we disregarded the notions of "shall" vs. "should", and using the Technical Support Document (TSD) for reference, created what we believe is a complete and

comprehensive FRMS for our facility. Paying close attention to "Open Shift" vs. "Extended Shift" as well as "Base Schedule" vs. "Core Schedule" as written in the RP, it is clear to us that per the HOS limits in Table 1 that, on an 8-hr schedule, a work set under "normal operations" would be 10 shifts and then time-off requirements would come into play or the exception process would have to be utilized. Our finished proposal totaled 13 pages, and encompassed RP-755 from A to Z.

We presented this in proposal form to CITGO on 10/25/2012, to which the Company responded that they believed we had used the Technical Service Document to rewrite RP-755 in our favor. Furthermore, the Company claims that they called API via telephone to inquire as to whether our interpretations of the RP and TSD were correct, and that Mr. Ron Chittim agreed with the Company's position, and that he (Chittim) had explained to them that the TSD is not intended to be used in this manner. (So much for "All questions must be submitted in written form.")

At this point, CITGO seems to only be interested in dealing with the Hours of Service limits. The CITGO refinery in Lake Charles, LA, (not USW-represented) is on a 12-hr schedule, and has an FRMS in place that does just that. The CITGO refinery in Corpus Christi, TX, (USW-represented) also on a 12-hr schedule, is struggling with the details of applying and implementing RP-755, just as we are. In our case, and at Corpus Christi, CITGO has struck boilerplate copies of Lake Charles' FRMS and delivered them as the Company's proposals. Needless to say, there is no reference whatsoever to the affected employees (Union) being key stakeholder involved with periodic reviews, involvement in incident investigations, handling fatigue situations, training for employees and their families on the awareness of fatigue and its effects, operator shelter climate and unit lighting, workloads, HOS limits during outages and normal operations, employee choice of schedules and laid out exception details, etc., etc.

CITGO has admitted that the Company would prefer that a 12-hr shift schedule was in place. . It seems probable then, that the Company is less inclined to agree to any favorable terms under 8-hr schedules for an FRMS. Just for background, the Operations employees at Lemont Refinery were on a 12-hr schedule from 1997 to 2000. When given the option in 2000, a vast majority of employees voted to return to 8-hr shift schedules.

Another unique item of concern is our fire department. For the most part, the fire department is contracted out, and works a 24-hrs on/ 48-hrs off schedule. Most, if not all, of the firemen work at other fire departments on their days off. The fire department personnel are responsible for Hot Work and Confined Space Entry permitting, and other safety sensitive tasks in addition to emergency response. The Union believes that the fire department personnel must be subject to RP-755, in the same manner as Operations, Maintenance, Laboratory personnel and other contractors. The Company maintains that the fire department is exempt from RP-755 because they can sleep at the fire house and do not commute. We feel that that provision in RP-755 was made for offshore or maritime workers, and not for in-house fire department workers.

As to the question of declaring the CSB's status regarding RP-755:
We respect the USW representatives for dismissing themselves in protest, as it is quite apparent that the Union was being forced to function on a prima facie basis. We also took note that most of the requirements of companies were put in the form of a "Should" and that all HOS limits on overtime are in the form of a "Shall".

We feel fortunate that we have not been able to find any incidents at our facility with fatigue as a root or contributing cause in an incident investigation. Perhaps it has to do with the Illinois One Day Rest In Seven Act (ODRISA), or the fact we are on 8-hr shifts and we do have provisions in our CBA protecting us from being forced for more than 3x 16-hr shifts in a row. Even before RP-755 was mandated by NOBP, when approached by the Company, the USW Local 7-517 Workmen's Committee

met and discussed whether we believed worker fatigue was an important issue. The consensus was divided, yet all did agree that there were loopholes that we felt could be addressed. One such is the most extreme (but not very likely) case where an employee could voluntarily work 13x 16-hr shifts consecutively without an ODRISA permit, and without violating the CBA. We believed that to be excessive, and would have moved pro-actively to disable that potential, as well as enacting certain other restrictions on Hours of Service, in the interest of making work more safe, and life more satisfying for the represented employees. Again, these were things we were going to do without being mandated by RP-755.

We have been dealing with trying to re-negotiate RP-755, knowing that it has a 5-year review (to amend or withdraw) coming up in 2015. It is our opinion that RP-755 should be deemed an "unacceptable action" by the CSB, and that changes need to be made, favoring a common-sense and stepped approach to implementation that would give each location guidance and the ability to tailor an FRMS to their facility's needs based on their particular situation.

USW Local 7-517 has over 250 members at the Lemont Refinery, and one thing is certain: some like overtime and some don't. One major dilemma we face is that in limiting some employees from working overtime that they want, others will be forced to work overtime that they do not want.

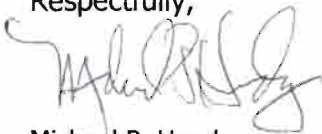
We feel it is fair to assume that the intent of the CSB recommendation or the API RP-755 was not the total elimination of overtime in the oil industry, but rather to protect people from being put in, or putting themselves in untenable situations, and to identify staffing issues before incidents occur rather than in the aftermath. We also assert that there should be a consideration of age, physical conditioning, and overall willingness to work overtime as a factor in fatigue.

USW Local 7-517 does support CSB Recommendation NO. 2005-04-I-TX-7, calling for the API and USW to jointly develop an ANSI standard to prevent fatigue. However, after trying to implement RP-755 we are hopeful that the CSB will vote to deem RP-755 an "open and unacceptable action", with a mind toward re-attempting to address the issue of worker fatigue with equal representation from all affected parties present and enabled, including those who do not necessarily favor 12-hr shift schedules.

As long winded as this is, it most certainly does not envelop all of our concerns. We have tried to present those that have given us the most difficulty.

Thank you for your time and consideration.

Respectfully,



Michael P. Hendry
President, USW Local 7-517



Wilmer F. Wittig
Financial Secretary, USW Local 7-517



David E. Handkins
Vice President, USW Local 7-517

On March, 15, 2013, the Chemical Safety Board (CSB) requested interested parties in the public and private sector, including the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA), to comment publicly on API-755 and CSB's review of the document currently being considered in the context of a CSB recommendation.

The following comments were prepared by me, Max Kieba, Engineer, PHMSA Office of Pipeline Safety, Engineering and Research Division, max.kieba@dot.gov, 202-493-0595. They are primarily from my perspective and based on my experience with various initiatives such as PHMSA's Control Room Management (CRM) implementation team (including guidance associated with Fatigue Mitigation), and as PHMSA's representative on the Department of Transportation's Human Factors Coordinating Committee (HFCC.) While they are based on input from other PHMSA team members, they are not to be considered an official position of PHMSA, particularly any topics that are more policy and/or pre-decisional in nature.

The CSB invited comments on the following items. Items requested from CSB are in bold and underlined, with my comments below each.

- **Any aspect of the draft CSB analysis summarized in their document;**
 - o I generally agree with the draft CSB analysis with some additional input below on process and lack of certain explicit requirements in the form of "shall" language
 - o For what it's worth on process, we submitted comments on a draft version of the RP around November 2009 (see separate attachment.) We are not aware if or how these comments were considered and disappointed no response was given by the committee one way or another. Other entities that truly follow the ANSI process typically give a reply, particularly anything considered technically substantive, and describe what did or did not get changed as a result, even if coming from a non-member.
 - o On lack of certain explicit requirements in the form of "shall" language, I would defer to the RP-755 committee on why they chose to use less mandatory language. I do note that this is a Recommended Practice (RP) which often has wording that is more guidance in the form of language such as may or should; versus perhaps a Specification which often uses more language in the form of shall statements.
- **Whether RP 755 is consistent with the CSB recommendation that triggered it; and,**
 - o I defer ultimately to the CSB on whether or not it is consistent with their recommendation.

- **Any other relevant aspects related to RP 755 and the management of fatigue risk in the refinery and petrochemical industries.**

- We typically do not regulate facilities in the refinery and petrochemical industries unless the operators and systems are subject to 49 CFR Part 195. For those subject to 49 CFR Part 195, Fatigue mitigation is addressed in 195.446 (Control Room Management (CRM) and more specifically 195.446(d). Comments below are primarily from the context of CRM. More information on the regulations, inspection guidance, frequently asked questions and other resources associated with CRM can be found at <http://primis.phmsa.dot.gov/crm/>
- API RP-755 contains valuable content, but pipeline operators would likely need to supplement with additional information for a comprehensive program for CRM regulations.
- General pros: It encourages implementation of FRMS, including
 - clearly defining roles and responsibilities
 - assessment of staff-workload balance
 - incorporating training, education, and communication
 - taking into account work environment
 - individual risk assessment and mitigation
 - investigation of accidents/incidents
 - attention to call-outs
 - incorporating an exception process
 - periodic review for continuous improvement.
- Some areas of concern/confusion
 - It is written for another purpose, not specifically CRM, but some are working it into CRM compliance.
 - It does not fully differentiate among and then consider the various types of shiftwork with the exception of some mention of night work.
 - There is a vague definition of workset in context of limits
 - There are limits such as 84 hours/7 12-hour shift day or night limits.
 - We do have some operators that are working 7-on/7-off schedules and beyond, particularly more remote locations such as offshore rigs or north slope Alaska. If a 7-on/7-off type plan is in use, we would expect to see
 - Excellent overall fatigue mitigation measures being taken; and
 - Excellent, specific fatigue mitigation measures being taken during the:
 - 6th and 7th successive day shifts;
 - 4th through 7th successive night shifts; and

- Last 4 hours of any 12-hour shift, especially during the midnight-to-dawn period.
- There are limits such as 14 consecutive days or nights during outages.
 - We do have some operators that are working schedules with these potential outages, particularly on the North Slope Alaska. For most other operators and situations, such outages would seem excessive as one would expect additional individuals could be brought in and relieve the individual well within 14 days. Similar to above, if there is a situation that requires the need for such outages, one would expect the appropriate countermeasures to reduce the risks associated with fatigue.
- Some of the limits are inconsistent with limits we've suggested through CRM guidance, although any limit may be acceptable if they can justify they have the appropriate measures in place to reduce the risk associated with fatigue and provide the opportunity for 8 hours of continuous sleep between shifts. The opportunity for 8 hours of continuous sleep is a requirement per the code.
- We are aware of some pipeline operators (both liquid and gas) using it for consideration and a basis for their CRM plans/procedures, but also aware of other operators that are choosing not to use it, particularly due to the high limits used within the document or other guidance being selected. Many operators are choosing to use limits more consistent with limits suggested in our guidance. Many gas operators are generally using guidance consistent with what is commonly known as the Southern Gas Association (SGA) framework document (some of which are also in line with PHMSA guidance.) Some liquid (and gas) operators are also working to make enhancements to API RP 1168 (Pipeline Control Room Management), including for fatigue mitigation.

From: Knott, John [JKnott@Suncor.com]
Sent: Monday, April 15, 2013 10:11 AM
To: fatiguecomments
Subject: Overtime pay and the restriction of operators

Gentlemen and Ladies,

I have been a process operator for 15 yrs. represented by a local SW union. The Fatigue issue has not been addressed locally nor will it be in the near future because it has the potential to limit the OT and therefore OT pay. Financially, many Operators depend upon the money O.T. provides them and work upward to 1000 hrs. overtime per year. The operators here resist any impact a fatigue study might have upon any limitation to O.T hours they can work, it could have a financial impact on them. It is well documented before and after the BP incident that the effects of fatigue and the work place needs to be addressed. It is obvious that many who work excess OT, work a night shift, are affected by mental fatigued related cognitive deficiencies. Many Sleep studies confirm this and work accidents can be correlated to fatigue issues.

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April 12, 2013

SUBMITTED VIA E-MAIL

Chemical Safety and Hazard Investigation Board
Office of Congressional, Public, and Board Affairs
2175 K Street, NW, Suite 650
Washington, DC 20037

Attn: D. Horowitz

Docket Number CSB-13-01

Dear Mr. Horowitz:

The American Chemistry Council¹ (ACC) is pleased to provide a written response to the U.S. Chemical Safety and Hazard Investigation Board's (CSB) March 23, 2013 request for comments on certain CSB recommendations. These recommendations are listed below and are followed by ACC's comments. We hope that CSB will find our contribution helpful. Should you have questions about our input, please contact me by phone at (202) 249-6426 or by e-mail at Rachel_meidl@americanchemistry.com.

Very truly yours,

A handwritten signature in dark ink, appearing to read "Rachel Meidl", written over a light gray background.

Rachel Meidl
Director, Regulatory & Technical Affairs

¹ ACC represents the leading companies engaged in the business of chemistry. ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. ACC is committed to improved environmental, health and safety performance through Responsible Care®, common sense advocacy designed to address major public policy issues, and health and environmental research and product testing. The business of chemistry is a \$760 billion enterprise and a key element of the nation's economy. It is the largest exporting sector in the U.S., accounting for 12 percent of U.S. exports. Chemistry companies are among the largest investors in research and development. Safety and security have always been primary concerns of ACC members, and they have intensified their efforts, working closely with government agencies to improve security and to defend against any threat to the nation's critical infrastructure.



**American Chemistry Council Response to the March 23, 2013
Chemical Safety and Hazard Investigation Board
Request for Comments**

1. Recommendation No. 2005-04-I-TX-7 to the American Petroleum Institute (API) and the United Steelworkers International Union (USW)

Work together to develop two new consensus American National Standards Institute (ANSI) standards. In the second standard, develop fatigue prevention guidelines for the refining and petrochemical industries that, at a minimum, limit hours and days of work and address shift work. In the development of each standard, ensure that the committees a. are accredited and conform to ANSI principles of openness, balance, due process, and consensus; b. include representation of diverse sectors such as industry, labor, government, public interest and environmental organizations and experts from relevant scientific organizations and disciplines.

ACC Response: ACC considers RP 755 to be sufficient in its current form and believes that revisiting the standard is not warranted. As a result of this standard, there has been significant progress in the area of fatigue management that will continue to improve through periodic reviews and updates of the standard. ACC has reviewed CSB's evaluation of RP 755 and API's response to the recommendation and concluded that CSB did not adequately consider the nature of the ANSI process when it developed its recommendation. Furthermore, the agency also made unrealistic assumptions about the content of the standard, which led CSB to deem the standard unacceptable. ACC believes that if the agency re-evaluates the standard—considering the spirit of its recommendation and keeping in mind that the standard is a living document—it will find that RP 755 represents significant progress in the area of fatigue management in refinery and petrochemical facilities. ACC therefore recommends that CSB conduct such a re-evaluation and is confident that the agency will arrive at a more positive conclusion about the efficacy of RP 755.

ACC looks forward to working constructively with CSB and the other RP 755 Committee members to conduct the first periodic review of RP 755.

2. Recommendation 2001-05-I-DE-1 to the Occupational Safety & Health Administration (OSHA)
Ensure coverage under the Process Safety Management Standard (29 Health Administration CFR 1910.119) of atmospheric storage tanks that could be involved in a potential catastrophic release as a result of being interconnected to a covered process with 10,000 pounds of a flammable substance.

ACC Response: ACC believes that reopening the PSM standard as recommended by CSB is not warranted. These issues have been fully and adequately addressed through the following vehicles: the 1997 Meer court decision (Secretary of Labor v. Meer Corporation, OSHRC Docket No. 95-0341); OSHA interpretation memorandum distributed to Regional Administrators from the Director of Compliance Programs (Subject: Coverage of Stored Flammables Under the Process Safety Management Standard, dated May 12, 1997); and a February 11, 2003, OSHA letter of interpretation (Subject: Clarification of



PSM applicability to processes that are based partly or solely on quantities in connected atmospheric storage tanks). Consequently, reopening the PSM standard for revision is not necessary.

3. Recommendation No. 2005-04-I-TX-R9

Amend the OSHA PSM standard to require that a management of change (MOC) review be conducted for organizational changes that may impact process safety including:

- a) Major organizational changes such as mergers, acquisitions, or reorganizations;*
- b) Personnel changes, including changes in staffing levels or staff experience; and*
- c) Policy changes, such as budget cutting.*

ACC Response: ACC believes that reopening the PSM standard as recommended by CSB is not warranted. These issues have been fully and adequately addressed through an OSHA interpretation memorandum distributed to Regional Administrators from the Director of Enforcement Programs (Subject: Management of Organizational Change, dated April 1, 2009). As a result, reopening the PSM standard for revision is not justified.

4. Urgent Recommendation to OSHA 2010-07-I-CT-UR1

Promulgate regulations that address fuel gas safety for both construction and general industry. At a minimum:

- a. Prohibit the release of flammable gas to the atmosphere for the purpose of cleaning fuel gas piping.*
- b. Prohibit flammable gas venting or purging indoors. Prohibit venting or purging outdoors where fuel gas may form a flammable atmosphere in the vicinity of workers and/or ignition sources.*
- c. Prohibit any work activity in areas where the concentration of flammable gas exceeds a fixed low percentage of the lower explosive limit (LEL) determined by appropriate combustible gas monitoring.*
- d. Require that companies develop flammable gas safety procedures and training that involves contractors, workers, and their representatives in decision-making.*

ACC Response: ACC is aware that the CGA is actively addressing this issue. We will defer comment until we have had time to review their efforts.



United Steelworker's Written Comments on Fatigue Risk Management Systems Evaluation, API RP 755 Development Based on Recommendation No. 2005-04-I-TX-7

Washington, DC, April 24, 2013

Good morning Mr. Chairman and board members. My name is Kim Nibarger and I am a member of the United Steelworkers (USW) union, and a Health and Safety Specialist for our International Union's Health, Safety and Environment Department in Pittsburgh.

The USW represents about 850,000 members in the United States and Canada employed in virtually every industrial segment of the workforce – steel of course, but also, paper, mining, aluminum and other nonferrous metals, chemicals, plastics, tires and rubber, glass, health care, and petrochemicals. Among oil refineries, the USW represents about 30,000 workers employed at more than 20 companies at over 70 refineries in the U.S. These refineries represent approximately two-thirds of domestic production. We represent many more in highly hazardous chemical plants all in need of effective fatigue management programs.

THE NATURE OF FATIGUE

Though many readers and listeners may already be aware, we would like to lay out some foundations about our understanding of fatigue. These form the basis for our positions on API 755 and what needs to be done to address this issue.

Fatigue is far more than just 'being tired.' A person may be tired if s/he gets less sleep than normal on any given night or two. This level of tiredness does not seriously affect cognitive ability, problem solving or the abilities to react with skill in emergencies. Persons can recover from an episode of tiredness by returning to a proper sleep cycle. In a normal, healthy work routine, in a matter of days there will be days off for further recovery.

Unlike 'being tired,' fatigue is the cumulative loss of sleep from working excessive hours and/or consecutive days without an adequate rest break. Key literature supports the notion that a maximum of four consecutive day or night shifts of 12 hours is about as many consecutive days an individual can work before fatigue begins to have an influence on them. After that, an individual requires two or three days off to get rested.

When, over several days, persons are not getting adequate sleep or working shifts that are outside their circadian rhythm (night shifts, e.g., 7 p.m. to 7 a.m.), they reach a state of sleep deprivation. While the intricacies of fatigue and sleep cycles can be complex, it is nonetheless clear that the problem of fatigue is not about going a day or two with less than optimal sleep, when a person has several days to rest and recover. In refineries, the issue is about long periods of time with insufficient sleep coupled with inadequate time to rest before beginning another work cycle.

Fatigue –Safety, Health Psycho-Social Issues. Besides the effect fatigue can have with safe operations, fatigue has also been associated with a number of physical ailments. Diabetes, high blood pressure, obesity, anxiety and increased depression are all problems that can be related to sleep deprivation.

There is an additional strain on family life of people working rotating 24/7 shifts. It often means you miss a holiday with the family. You are not able to attend school functions for your children; a sports event or play they are involved with or a band performance let alone your spouse's birthday or an anniversary. These all increase the tension of everyday life and often put a strain on marital relations.

So there are many reasons above and beyond just the safety factor for us to be concerned about how the role of fatigue plays out with our members. We want to do all we can to protect them from being fatigued.

API 755 – A FLAWED PROCESS

Based on a recommendation from the Chemical Safety and Hazard Investigation Board (CSB) report on the BP Texas City accident of 2005, the USW entered into discussions with the American Petroleum Institute (API) regarding the development of a Fatigue Risk Management Standard (FRMS). Though we worked diligently to make the process work, we ended our participation over the issues of corporate domination, inadequate stakeholder participation and disagreement regarding the process of consensus making. We were promised a consensus process, but instead of working to resolve differences the API moved quickly to vote where the union was consistently out voted by the industry majority. Following the USW withdrawal, the API completed a FRMS titled API RP 755 (hereinafter referred to as API 755).

API 755 – A FLAWED RULE

API 755 does not meet the intent of the CSB recommendation. The API process allowed the oil industry to develop a recommended practice that accommodated the industry's desires related to flexibility, production and profit. In the end, API 755 sacrificed meaningful fatigue risk reduction and is too weak to drive any meaningful improvements.

Should and Shall – An Enormous Gulf. API 755 is full of non-mandatory 'should' language that is consistent with the API RPs forward that states, "Should: As used in a recommended practice, 'should' denotes a recommendation or that which is advised but not required in order to conform to the RP" - This language supports companies that wish to continue poor past practices in staffing and scheduling and their contention that they are unobligated to reduce fatigue-related risk.

In contrast, much of the 'shall' language of API 755 pertains to what workers are obligated to do with individual risk assessment and mitigation (see Section 4.6). The other section of API 755 that speaks to what 'shall' be done refers to work hour limits (see Section 4.8). However, this language is followed by the exception process where a company can skirt any 'shall' language by filling out the proper form.

There is no scientific basis for the hours of service guidelines in API 755. There are normative references in the bibliography; however none are noted in API 755.

Imbalance Between Workload And Staffing Levels. In a recent white paper, Circadian, a recognized global leader in 24/7 workforce performance, stated, “One of the most important, but frequently overlooked, root causes of employee fatigue and human error is an imbalance between workload and staffing levels.”¹ The consequences of understaffing are explored from extensive academic research as well as industrial experience. Further, they contend that the most common cause of the fatigue that contributes to industrial accidents and injuries is excessive overtime driven by understaffing.

The Circadian white paper states that an overall level of 10 percent to 12 percent overtime is usually safe, healthy and productive. However, Circadian advises employers that a level of 15 percent overtime should be a trigger for starting to hire more people. Further it identifies “at 20 percent it is *arguably unsafe* (emphasis added) to operate because of the significantly increased risk of human error”.

A paper recently published by American College of Occupational and Environmental Medicine (ACOEM)² also addresses the issue of staffing and how it relates to fatigue. Both the Circadian and ACOEM papers have a host of references to support their conclusions.

NATIONAL OIL BARGAINING: AN ATTEMPT TO FIND A NEW STARTING POINT

In 2012, the USW, in National Oil Bargaining talks with the oil industry, was committed to meaningfully addressing our concerns about fatigue at refineries. We take the Baker Panel, the CSB’s and others’ contentions that fatigue and related issues represent increased risks to refineries, its workforce, and as a potential consequence, nearby communities and environment. In doing so, the USW sought to encourage refiners to fully staff their process units and maintenance departments, in part by committing to fill open shifts.

It is the USW’s position that progress on staffing is fundamental to addressing fatigue. When the union determined that such progress was impossible in the process of developing API 755 it opted to bargain with the oil industry in putting API 755 in place as the only mutually acceptable starting point in addressing fatigue risks.

The USW’s acceptance of API 755 as the starting place in those discussions should in no way infer that the USW accepts it as sufficient to address fatigue issues in the refining sector. It was merely a place to start.

The language agreed upon in National Oil Bargaining states:

The Parties acknowledge that a Recommended Practice (RP) regarding Fatigue Risk Management Systems has been issued by the American Petroleum Institute (API), API Recommended Practice 755. The parties agree to meet and discuss as soon as practicable, but not later than sixty (60) days from the ratification of this agreement, the application and implementation of this RP. The Parties will fulfill any bargaining obligations, where necessary, in connection with the implementation of the new RP, including changes to the existing contract

¹ Staffing Levels A Key to Managing Risk in 24/7 Operations, Circadian 2013

² Fatigue Risk Management in the Workplace, ACOEM Guidance Statement, February 2012

language. It is agreed and understood that both Parties will provide support and cooperation to ensure successful implementation of the new RP.

In agreeing to this contract language, the USW sought a national, consistent rule and a level playing field to begin the process of reducing risks related to fatigue at U.S. refineries. All refineries covered by the agreement would have the same benchmarks.

The National Oil Bargaining agreement between the USW and refiners on fatigue was designed to serve several purposes. In our initial National Oil Bargaining discussions, the industry stated that this language would require them to hire more employees to meet the guidelines on working hours.

As it has turned out, nearly every company, and in some instances individual locations within a company, has determined they can develop a better fatigue standard than what the API developed on behalf of the industry as a whole. The USW has received an array of site- and company-based fatigue risk management proposals all across the spectrum. Most proposals have been designed to both accommodate previous staffing levels and to work at the top end of the work hour allowance specified - seven consecutive days followed by a 36 hour break (see Table 1, p. 9). This is in spite of language within API 755 that cautioned regarding hours of service, “Consistently working at the limits shown is not sustainable and may lead to chronic sleep debt.” (p. 4, section 4.8). Yet, in practice, it seems that the industry goal has been to design work-rest schedules that continually test these prescribed limits. This company position is not only a point of contention for the USW - it ignores the overall API 755 goal to “prevent employees from frequently working at or near these limits.”³

In contrast to the benchmarks discussed by Circadian, some of the fatigue programs refining companies have proposed to the USW call for maintaining reasonable levels of total plant and individual overtime without defining what is reasonable. Others’ proposals call for a metric identifying the total number of people working overtime and comparing it to a benchmark of 50 percent.

A Weak Foundation Hinders Progress. What has developed as a common refining industry practice is the creation of work hour schedules with absolutely no scientific basis for the prevention of hazardous levels of fatigue. In doing so, the refining industry has developed new schedules for the Hours of Service Guidelines currently in 755 that have extended the Maximum Consecutive Shifts and altered the minimum time off after a work set.

A Voluntary Standard with Few Volunteers. A number of refiners have even gone so far as to claim that since API 755 is only a recommended practice, they do not have to follow it. USW’s concern is that all the API ‘standards’ as they are most commonly referred to are all voluntary. As a consequence, companies view them as something they can follow at their discretion. Our understanding is that if you say you are following a RP, you are required to follow its provisions. In this case, the contract language alone should move refiners to meet API 755.

A Culture of Risk. The basis of the union’s frustration must be apparent. The rules of the game are set by and for the industry, agreed to by the industry, and then flaunted by the industry. This pattern certainly legitimizes those who question the industry’s full commitment to safety and its

³ API Recommended Practice 755

grasp of the importance of the role that fatigue prevention plays in achieving safe refineries. This pattern does not speak well regarding a safety culture, about which workers hear endless industry slogans, but rather it speaks to an imposed culture of risk. It also speaks poorly about rules written as recommendations by the same organization whose primary mission is to lobby for the oil industry.

So, given the deep flaws in API 755 in addressing fatigue, and the refining company proposals coming to the USW across the negotiating table, it appears that the refining industry has minimal regard for the recommended limits on work hours and schedules. Instead we are left to think they are targeting something more workable to their interests and in disregard to the imperatives of health and safety.

Workers Carry the Burden. Fatigue has been cited as a contributor to mistakes made in a number of industrial accidents. When workers are fatigued their judgment becomes impaired. The oil industry has been an adamant proponent of alcohol and drug testing. They have insisted upon programs that tests for initial hire, at random, and ‘for cause.’ These are claimed necessary to assure individuals are not working impaired. Coincidentally, some researchers have defined levels of fatigue in alcohol consumption equivalents. Nonetheless, when the union has asked for assurances that workers are not working impaired due to fatigue, we have received virtually no support from the industry.

The union is left to conclude that API 755 was developed and written in such a way to ensure refiners that limits on fatigue-related safety will not get in the way of the industry’s other operating fundamentals. The following is an example. The language on Hours of Service that allow a 14 consecutive day work schedule during outages is not about addressing fatigue; it is a convenience built into API 755. This convenience allows refiners to create rules for extended consecutive work days at a time that has been identified as challenging because the tasks are out of the ordinary rather than provide adequate rest periods for workers. API 755 concludes that workers involved in working extended hours during plant outages should use their time off the job to get appropriate sleep.

In the U.S. refining industry, sites shut down processes units and conduct maintenance overhauls – turnarounds – every five to six years on average. It should be noted that in Europe, where trends in improved refinery safety are much better than here in the U.S., turnarounds are much more frequent. It would also be beneficial to note that work hour limitations in the UK are 48 hours in a seven day period, with a required uninterrupted rest period of 11 hours in 24 hours.

A Simple Solution. The good news is that there is a very simple solution. Increased staffing The bad news is that the refining industry does not want to accept this remedy. The existing API 755 does not address the root cause of the problem and therefore, will have little if any impact on solving the problem

In summary, it is the position of the USW that:

- Fatigue is hazardous to workers’ health and safety on a number of levels. Of critical importance is the potential fatigue contributes to major process incidents that can threaten an entire workforce, communities and the environment.

- API 755 is fundamentally flawed; weak and incapable of driving real risk reductions related to fatigue.
- The industry is gaming the ‘should’ language and other limitations of API 755 so they don’t have to hire to achieve safe levels of staffing.
- The work hour guidelines in API 755 are being used to manipulate workers schedules, not restrict their consecutive work days and ensure adequate rest.
- Through industry-wide, national collective bargaining, the USW reengaged in the process of trying to facilitate meaningful improvements in fatigue risk prevention – thus far without substantial success.
- The U.S. refining industry is coupling its own inaction with an emphasis on workers maintaining alertness through self-assessment and modification of their sleep habits. This abdication and shifting of responsibility is a clear sign of a poor corporate safety culture. In contrast it speaks to a culture of risk taking.

There is nothing in API 755 or in the industry response to it that will help lessen the burden on our members caused by fatigue.

Without hiring to fill open shifts, this issue of fatigue will not be addressed.

Thank you for allowing me to address you today on this very important issue.

Kim Nibarger
 United Steelworkers
 Five Gateway Center
 Pittsburgh, PA 15222

CSB-13-01

US Chemical Safety Board

Re: Comments Related to API RP 755

4/08/2013

To Whom It May Concern:

I am writing to provide comments in opposition to the new API RP755 document. I am in support of more enforceable language in the document and also support the document becoming more than a recommended practice.

If one steps back and looks at the history of tragedies in industry and how enforceable rules ever get to be in place it's clear that eventually it ends up being only about money and the tacit threat of taking it away that means anything and actually begets change. It's really up to having standards that defense attorneys can use to prove negligence that means anything.

If you ask yourself why the trucking, aviation, and nuclear industries have clear enforceable language in their fatigue standards it's because in each case there are some very few individuals who have many people's lives in the palm of their hands. It is because in these cases clearly some very few individuals, with a few well placed errors can wreak tremendous havoc, death and destruction. Can someone explain how this is not the case in the process industry? In fact it's the case in more than the process industry. This same circumstance exists within other industries like steel making, the paper industry, and many others. It's also the case amongst categories of equipment operation like the operators of large boilers at industrial and utility plants. I would suggest we as a society become pro-active with this issue and apply fatigue standards to everywhere that the lives of many individuals is in the hands of a few. We should not be waiting until there is another horrific tragedy to deal with this.

It's also been my experience that this entire matter also starts right at the top. I applaud the mention of needing metrics for corporate boards to better understand these kinds of issues from a global sense. It's clear that there is a short coming here. The only metric that is universally available today is an accident incident rate. When I have interfaced at the "C" level of different global organizations I always found these individuals to be very sincere and wanting to drive the cause of safety. There always however seems to be a tremendous chasm between them and the reality of what happens at sites. In the cases where the "C" level folks have had better evaluation tools they were able to act more effectively.

I would propose that the organizations mentioned by CSB as needing to participate in solutions to this incident consider taking up the cause of deriving better metrics that can be used by "C" level folks that are more proactive and not reactive. For example, the potential for accidents during start-ups and turn-arounds has been stated in several documents to be 5 to 10 times as high as normal operations. There could be metrics developed that indicate things like the number of staff deployed, their hours per week planned, their relative experience, their hours of training, versus a minimum required. It can be made a

policy within organizations that a minimum human factors robustness score and plan must be established before a project can take place.

This human factors robustness tool can be used as a yard stick for minimizing human factors risks. The plans can be audited and it can be then reported to “C” level folks that for example there were 10 turnarounds done, 6 of them with ended up with very robust human factors precautions, two with average, and two with below average robustness. Even though none of these may have ended up with incidents it’s clear that the risk of an incident was greater when there were not robust human factors precautions in place and actually implemented. It’s this potential that must be attacked and used to drive change, not actual incidents after the fact.

I recognize that from an industry perspective enforceable fatigue language means a transition period where there will be many steps and stumbles. It will certainly mean increased labor costs. When one considers this labor cost in the overall context of operations for most entities in this sphere it’s really an insignificant number. It will never be an amount that can justify the pain and suffering that is associated with not doing the right thing here. Nothing can.

It would be great if at least a phased approach can be started that addresses enforceable fatigue standards as it relates to turn-arounds. This can at least address what everyone recognizes is the greatest risk.

Fatigue factors are not an “if or a maybe” when it comes to process safety. Other really big industries have already decided that it’s REAL. The Texas City incident needs to be the turning point for the process industry and time for a paradigm shift. Otherwise, as Trevor Kletz has indicated in his writings incidents like Texas City will only repeat over and over again.

Sincerely,

John R. Puskar, P.E.
JPuskar@aol.com

RE: Docket Number CSB-13-01

Comments by Thomas G. Raslear, Ph.D., Chief, Human Factors Research Division, Federal Railroad Administration, concerning the Chemical Safety Board's (CSB) draft evaluation of the actions taken by the American Petroleum Institute (API) and the United Steel Workers International Union (USW) to implement the CSB recommendation to develop an ANSI consensus standard with guidelines for fatigue prevention.

Concerning the draft CSB evaluation

Based on the information provided by CSB in their draft evaluation, I agree that the document RP 755 was not the result of an effective consensus process. The withdrawal of USW from the committee that was developing the RP is a serious deficiency since it is extremely important to have both labor and management engaged in the process to manage fatigue risk. A key component of a fatigue risk management system (FRMS) is the responsibility shared by labor and management to minimize fatigue in the workplace. It is hard to see how labor would participate effectively in an FRMS that they were not instrumental in formulating.

CSB also faults RP 755 for a lack of explicit requirements in the form of "shall" language. The forward to RP 755 clearly states that "... 'shall' denotes a minimum requirement in order to conform to the RP.", and that "... 'should' denotes a recommendation or that which is advised but not required in order to conform to the RP." Effectively, RP 755 requires a company to conform to very little. Many of the basic elements of a FRMS are not required by RP 755, as noted by CSB. These include

- Written fatigue policies and processes
- Establishment of staff with responsibility for FRMS
- Integration of FRMS into existing safety management systems
- Assessments of workload and staffing needs
- Assessment of environmental and other conditions that affect fatigue
- Investigation of fatigue as a factor in incidents
- Periodic review of FRMS

I agree with the CSB on this point. If these basic FRMS elements are not required for conformity to RP 755, the effectiveness of the FRMS is questionable.

The CSB evaluation indicates that there is undue emphasis on the "personal" component of fatigue control in RP 755. I agree. Individuals are poor judges of their own fatigue, and the technical report which supports RP 755 explicitly states this. Education and training can help workers and supervisors to become better judges of fatigue, but this is a poor substitute for objective measures of fatigue based on the analysis of work schedules with validated and calibrated biomathematical models of fatigue or other methods. In an effective FRMS, management has a policy indicating that employees have a responsibility to report to work well-rested, and that management has a responsibility to schedule work so as to provide adequate opportunities for employees to obtain rest. Employees should only accept assignments when adequately rested to safely perform duties, and management should have a non-punitive process for handling legitimate reports of fatigue by employees. In the absence of objective measures of

fatigue, there is no way to determine whether the shared responsibility to minimize fatigue has been violated by the employee, management or both.

The CSB evaluation indicates that the hours of service (HOS) limits in RP 755 are “...more permissive, and therefore less protective, than those suggested by current scientific knowledge.” Moreover, CSB notes that these permissive limits are based on the assumption that implementation of an FRMS will compensate for working “...excessive hours and days...” Again, I agree with CSB. RP 755 does not require the key elements of an effective FRMS, as noted above. Consequently, the assumption that an FRMS will compensate the risk of working excessive hours and days is unfounded. It appears that rather than mitigating fatigue, the FRMS is being used to justify work schedules that are known to cause fatigue. Before such schedules are allowed to be used, the effects of the schedules on fatigue should be estimated with a biomathematical fatigue model with and without the specific mitigations contained in the actual FRMS that will be used. If the fatigue estimate indicates that the level of fatigue is acceptable for that job, actual work and sleep data should be collected from employees working those schedules and evaluated for fatigue using the same biomathematical fatigue model to verify that the FRMS actually mitigated fatigue. The technical support document makes a similar point on p. 41.

Concerning RP 755 and the Technical Support Document

RP 755 and its technical support document appear to have been created in the absence of data about work schedules, sleep patterns, fatigue and accidents/incidents in this industry. This has, admittedly, been the norm in other industries, but the time has come when this pattern should be broken. Recommended practices, HOS guidelines (or limits or regulations) only make sense in the context of what actually happens regarding work schedules and sleep in an industry. What are the types of work schedules that are worked in this industry? What are the typical start and stop times for each of the work schedules? How many hours of total and primary sleep and how many sleep periods do employees obtain under each work schedule? What are typical commute times? What is the prevalence of sleep disorders in this population? This information can be the basis of an analysis of fatigue, using a biomathematical model, for the industry or for individual sites. The fatigue analysis would indicate what segments of the workforce are most at risk from fatigue. An effective FRMS would target those segments of the workforce so that valuable resources could be allocated for the maximal effect. The fatigue analysis would also serve as a baseline for the industry or for an individual site to determine whether RP 755 or specific FRMS implementations were effective in reducing fatigue. This is the intent of the Periodic Review element of any effective FRMS.

However, it appears that RP 755 is at odds with its technical support document regarding this. In section 4.9 of RP 755 key parameters of the FRMS that should be monitored are considered to be percentage overtime, number of open shifts, length of worksets and number of exceptions. Yet the technical support document (p. 8) specifically states that “...the measurement of ‘successful’ fatigue management is flawed if it relies on the business’ compliance with the input variables (e.g. number of work/rest hour HoS regulatory violations) rather than the evaluation of any output variables (e.g. actual employee fatigue impairment, fatigue-related accidents).” On p. 40 the technical support document specifically recommends that API companies “...collect and analyze data on operator sleep, health, and safety performance as part

of their FRMS...”. It is my opinion that objective measures of fatigue need to be included in any FRMS. There are several biomathematical models of fatigue now available that can be used for this purpose (see p. 41 of the technical support document). Fatigue cannot be managed if it is not measured.

RP 755 again does not follow the advice of its own technical support document regarding the inclusion of stakeholders in the FRMS. On p. 9, Table 1, the technical support document indicates that a key characteristic of a successful FRMS is that it is “Cooperative – Designed together by all stakeholders”. The technical support document agrees with the CSB evaluation of RP 755.

The exception process of RP 755 (section 4.8.5) also appears to be in conflict with the advice of its technical support document. The technical support document states on p. 13 that “Employee involvement in the scheduling selection process is a critical factor...”. Yet RP 755 indicates that only the immediate supervisor and one other management representative **shall** be involved (emphasis added).

Concluding Remarks

I totally agree with the CSB evaluation of RP 755. RP 755 does not meet the intent of the CSB recommendation. RP 755 would have been more consistent with the intent of the CSB recommendation if it had followed the advice and information contained in the technical support document.

From: Marlon Ratliff [mrat59@yahoo.com]
Sent: Friday, April 12, 2013 2:56 PM
To: fatiguecomments
Subject: Comments

I have worked rotating shifts in the chemical industry for twelve years and have been working under the current API 755 policy and find that it does nothing to prevent fatigue. In fact what I have experienced is the opposite. Limiting the work hours has resulted in the constant bouncing of the workers schedules. It has taken away the flexibility that is necessary to try to balance work and home life while managing a rotating shift schedule.

I disagree with the comments that a person can not determine when they are fatigued. If an individual can not determine this for themselves then who is supposed to do it? There is a human factor that has been totally ignored in the development of API 755. People do not fatigue at the same rate. Many factors affect it. Stress, age, fitness level, lifestyle, job position. So to simply say you can only work so many days or nights then you need to be off totally ignores these factors.

Moving forward I agree the stakeholders need to be involved in any further discussions about this issue, but it needs to include people that actually work shift work. Having representatives from the big companies looks good on paper, but unless they work rotating shifts they are not the experts. Also having fatigue management companies that will potentially benefit from development of this recommend practice is a huge conflict of interest. Seeing what affect the current version of API 755 has had on workers in the industry I think that more restrictive hours limits is a mistake.

Thanks,
Marlon Ratliff
Baytown, TX
281-421-1158

From: Reedy, Michael D [REEDYMD@cpchem.com]
Sent: Sunday, April 07, 2013 9:45 AM
To: fatiguecomments
Subject: API fatigue policy

CSB,

I do not understand why we need this fatigue policy. I have watch the CSB video many times, of the BP explosion, and the problem wasn't fatigue, the problem was 1. lack of communication between the operators from the day and night shifts. 2. The lack of maintenance on the instrumentation that was on the process vessel. The fatigue policy as it is written is to complicated. It is forcing overtime on those that do not want to work it and keeps those that want to work it form working the overtime. It is keeping the average worker from making extra money. I personally have worked many shutdowns that have gone twenty to thirty days long and I have never had a problem with fatigue. When a person volunteers or gets forced to worked a 7-12 hr schedule, it is that persons responsibility to rearrange his/her life to fit that schedule. If you really want to have a good fatigue policy then write one that deals with the amount of time a person works in a day not the amount of days a person works in a row. I know of one company that force their employees to work as many as 18 hrs in a day. I'm sure there are more out there.

Thanks for your time.
Feel free to call.

Michael Reedy
Chief Steward I.B.E.W. L.U. 716
Office – 713-475-3437
Pager – 713-613-8841

From: Gomez, Manuel
Sent: Friday, April 12, 2013 1:05 PM
To: Kaszniak, Mark; Morgan, Christina
Subject: FW: (CSB-13-01)

FYI

Manuel R. Gomez, DrPH, MS, CIH
Director, Office of Recommendations
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manuel.gomez@csb.gov

From: rbs1991@frontier.com [<mailto:rbs1991@frontier.com>]
Sent: Friday, April 12, 2013 12:16 PM
To: fatiguecomments
Subject: (CSB-13-01)

I am a 52 year old chemical operator at a major chemical plant in Marietta Ohio. I am glad to see the CSB understands the need for a Fatigue Risk Management System.

After doing some research Reading the ACOEM Guidance Statement in JOEM volume 54 number 2 Feb. 2012 I ask the HSE manger on site if we had any fatigue risk guidelines. He did not really know what I was talking about. I told him where he could get some information and ask if corporate had one, I guess not. I would like to out line some concerns.

In the unit I work in we have 4 rotating shifts. There are 7 chemical operators on shift for the most part we are 50 plus years old approx 5 weeks vacation 3 personal choice days plus sick days plus put on special assignments PSM, hazops etc. We are to the point of covering 7000 man hours on overtime and forced overtime. Operators who put in for vacation are somewhat protected from being forced this leaves a smaller pool to cover jobs.

On our shift schedule the so called Long Break is misleading because we are the only shift that can cover Friday day, Sunday night, Tuesday day, Thursday night. So there is a good chance you won't get a Long Break from end of May to Jan 1 unless you have a vacation around it since all hours are covered by overtime and forced overtime.

Since a lot of management works 8am to 4pm. I will give an example of a shift worker the ACOEM was right on. I go out on Friday Night I leave house around 4:30 pm arrive at plant around 5pm relieve operator at 5:20pm work 12, operator relieves me at 5:20 am get home around 6am try to get to bed by 7am sleep to noon fix something to eat, leave for work at 4:30 pm by the time you finish up Tuesday morning you are sleep deprived. But no you just got forced for Tuesday night and Wed. night you now finish up Thursday morning, tired but you know you have to sleep Thursday night because you have to get up at 3:50am Friday to go out on short days. Leave house 4:30am get to plant, relieve operator at 5:20am work 12 get home 6pm try to be in bed around 9pm back up at 3:50am If you feel bad call off some one else gets forced just a vicious cycle.

One time awhile back on my last night I got up at 11am went to work did 12 hours came home around 6am but did not go to bed I had a lot to catch up on around house, around 2pm I was in garage working on my mower the phone rang it was the plant some one had called off for the night shift I told them I had not been to bed since 11am yesterday Sorry about your luck I need a warm body (if not, one operator gets forced over 4 another forced in 4 hours early, job left unmanned or idle the middle 4) you are forced in, around 1am I was numb drove home that morning with windows down This is why we need a Fatigue Risk Management System, Because we have contract language for relief operators. We have had them in past but it is never a priority to fill them when people retire or bid out. The operator that had a relief job last, died during hunting season a couple years ago never been filled we just fill everything with overtime, until the CSB or OSHA sets a Shall Do standard and educate on the real risk of fatigue.

Best Regards

Roger Shuman

Washington, WV 26181,

While drafting this on April 2 I walk in our lunch room and noticed one of our newer operators in the unit next to ours with his head down I ask if he was alright he said just tired this was his 15th 12 hour shift said he was getting forced 2 more he was in his 20's I told him I wish I could tell you it would get easier but I have been doing shift work for almost 30 years it doesn't.

(CSB-13-01)

April 12, 2013

Chemical Safety and
Hazard Investigation Board
Office of Congressional, Public, and Board Affairs
Attn: D. Horowitz
2175 K Street, NW
Suite 650
Washington, DC 20037

RE: Request for Comments on Draft Evaluation of Response to Board Recommendation on Fatigue Guidelines for Refinery and Petrochemical Industries

Dear Dr. Horowitz:

We are submitting these comments in response to the CSB Website Request for Comments on the draft evaluation of the actions taken by the API and USW to implement the 2007 CSB recommendation to develop fatigue guidelines for the refinery and petrochemical industries.

As you know, we were Members of the Chemical Safety Board in 2007 when the Board unanimously approved the recommendation to develop fatigue guidelines. So the subsequent work to develop guidelines and implement practices for fatigue prevention in the industry has been of interest and concern to us.

The guidelines that have been developed in the documents referenced in the draft evaluation – ANSI/RPI 755 and API Technical Report 755-1 – are no doubt not perfect and are certainly not to everyone's total satisfaction. However we think it would be a mistake for the Board to reject them as "unacceptable" based on the submission proffered in response to the Board's 2007 recommendation.

We disagree with the draft evaluation that ANSI/RPI 755 does not meet the basic criteria in the Recommendation. The Recommendation called for the guidelines to be developed under a "consensus" process as defined by the procedures for a standard to be adopted under the American National Standards Institute (ANSI). It is our understanding that the fatigue guidelines satisfied the ANSI consensus process. Second, the draft evaluation is critical of the guidelines' use of "should" rather than "shall." However, the 2007 Recommendation called for "guidelines" on fatigue prevention, leaving open how prescriptive the ANSI standard would be. As Board Members who voted for the Recommendation, we were well aware that fatigue guidelines would be a considerable challenge in an industry which had not previously had benchmarks or guidelines aimed at preventing worker fatigue, and in which both management and workers have historically often relied on a large amount of overtime work. The Board Recommendation did not anticipate or seek to impose the details of fatigue guidelines that fit the refinery and petrochemical industries.

We believe that the draft evaluation would add conditions and criteria that go beyond the intentionally broad and general Board Recommendation to develop fatigue guidelines. More generally, it is important to emphasize that the Board should evaluate responses to Board recommendations with a certain “judicious-ness” that recognizes that when making recommendations, the Board does not have either the technical expertise nor does it have the same responsibilities in terms of implementing policies, as those to whom recommendations are made. The Board recommends that they develop the standards (that they need a watch), but does not proffer specifics as to how they go about completing the task (how to build the watch). The Board’s credibility, and therefore its effectiveness, is strongest, when that distinction is recognized.

Thank you for your consideration of our views.

William Wright

William Wark

Gary Visscher

a

Comments on API 755 RP Invited by CSB, Washington

Job number
2013-0924

Author
Ernst Zirngast

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2 Introduction

On March 23, 2005, the BP Texas City refinery experienced explosions and fires in an isomerization unit (ISOM) that resulted in 15 deaths, 180 injuries, and significant economic losses. A CSB investigation found that the incident was caused by multiple technical, system, and organizational deficiencies and the agency issued recommendations to various parties. Among its most important findings, and the subject of this draft evaluation, the CSB investigation concluded that the ISOM operators were likely fatigued from working 12-hour shifts, some working as many as 29 consecutive days during the turnaround of the unit prior to startup, and that, as a result, the operators' judgment and problem-solving skills were likely degraded, hindering their ability to determine that the tower was overfilling with hydrocarbons and to take prompt corrective actions. The CSB found that neither the Occupational Safety and Health Administration (OSHA) nor the API had developed any industry safety guidelines or voluntary standards to manage and prevent fatigue as a risk factor, and especially to limit hours and days of work and manage overtime and shift work so as to prevent fatigue.

The CSB recommended that API and the USW jointly lead the development of an ANSI consensus standard with guidelines for fatigue prevention, along with the participation of other relevant stakeholders. The recommendation also identified the need to include in the development of the standard a broad range of stakeholders and relevant scientific organizations and disciplines, clarifying that the expectations for consensus went beyond those of a typical ANSI process. There were numerous equipment failures as well as other factors that contributed to the liquid overflow that led to the Texas City incident, but these were not the subject of this recommendation and are not addressed in the evaluation. Information about them can be found in the investigation report and on the CSB webpage (www.csb.gov).

3 Recommendation by CSB

The recommendation was as follows:

Recommendation No. 2005-04-I-TX-7

Work together to develop two new consensus American National Standards Institute (ANSI) standards. In the second standard, develop fatigue prevention guidelines for the refining and petrochemical industries that, at a minimum, limit hours and days of work and address shift work. In the development of each standard, ensure that the committees a. are accredited and conform to ANSI principles of openness, balance, due process, and consensus; b. include representation of diverse sectors such as industry, labor, government, public interest and environmental organizations and experts from relevant scientific organizations and disciplines.

Both recipients initially accepted the recommendation. The API, already an ANSI-accredited organization with experience in developing voluntary consensus standards, formed an ANSI committee that the USW joined. In August of 2009, however, the USW withdrew from the committee in protest of what it perceived to be an imbalance in voting members (management vs. union and other representatives). The API proceeded with the committee's work and issued an ANSI-approved Recommended Practice (RP 755) in April 2010. CSB staff participated in parts of numerous meetings in person or by conference call, and were able to review the documents relevant to the development of the RP. Process and plant information

4 Comments by SwissRe Risk Engineering Services

4.1 Introduction

The API 755 which is currently available as a RP Recommended Practice is not satisfactory in the view of SwissRe.

4.2 Comment to question 1

Therefore we comment as follows:

Any aspect of the draft CSB analysis summarized in this document;

We generally support all the comments made by CSB.

We especially want to put emphasis on the cumulative effects as researched by Van Dongen HPA, Maislin G, Mullington JM, Dinges DF. The cumulative cost of additional wakefulness: dose response effects on neurobehavioral functions and sleep physiology from chronic sleep restriction and total sleep deprivation. SLEEP 2003; 26: 117-126.

We were told by the fatigue experts that a 40 hour sleep deprivation is comparable to 10 consecutive days with only 5 hours of sleep, which yields a performance like being drunk with 1.2 per mille of alcohol. So when API 755 RP allows 14 consecutive night shifts of 12 hours, with say 2 hours travel each way from home and 1 hour for meals and preparation at home, it would yield the accumulated effects similar to 1.2 per mille of alcohol. A two hour commute can be reality especially in Texas. Extended shifts exacerbate the exposure even more. So we conclude it unsafe.

4.3 Comment to question 2

Whether RP 755 is consistent with the CSB recommendation that triggered it;

Currently API 755 RP is not consistent with the CSB recommendation

4.4 Comment to question 3

Any other relevant aspects related to RP 755 and the management of fatigue risk in the refinery and petrochemical industries.

Human Performance Integrity HPI:

Some other elements apart from fatigue affect the human performance integrity such as:

1. Effects on fatigue from eg. forward vs backwards rolling shift patterns, age
2. Adequacy of organization
3. Working Conditions such as lighting, noise, food etc
4. Adequacy of MMI & Operational Support
5. Number of simultaneous goals
6. Availability of procedures & plans
7. Available time
8. Adequacy of training
9. Crew collaboration quality

Please note that in April 2010 SwissRe had given an introduction to CSB regarding a tool that had been developed to assess human performance integrity HPI. The tool had been validated by site audits. This presentation can be repeated to parties interested.

Regarding table 1 of API 755 RP

SwissRe could envisage the follow changes:

Table 1—Hours of Service Guidelines for 8-, 10-, and 12-hour Shifts

Operational Situation	12-Hour Shift	10-Hour Shift	8-Hour Shift
Maximum Consecutive Shifts (Day or Night) in a Work set			
a) Normal Operations <i>Day</i>	7 shifts	9 shifts	10 shifts
b) Outages <i>Day</i>	14 shifts	14 shifts	19 shifts
<i>Normal & Outages: Night</i>	4	5	6
Minimum time off after a work set			
a) Normal Operations <i>day</i>	36 hours	36 hours	36 hours
• Work set of 4 or more night shifts	48 hours	48 hours	48 hours
• After 84 hours or more regardless of day or night	48 hours	48 hours	48 hours
b) Outages	36 hours	36 hours	36 hours
Extended Shifts			
a) Unscheduled maximum shift	16 hours	16 hours	16 hours
b) Time off after shift			
• 10 to 16 hour shift	N/A	N/A	8 hours
• 12 to 16 hour shift	N/A	8 hours	N/A
• 14 to 16 hour shift	8 hours	8 hours	N/A
• >16 to 18 hour shift	10 hours	N/A	N/A
Maximum Number of Extended Shifts per Work set	1	1 for 14 hour shift or 2 for 12 hour shifts or for 3 or more 12 hour shifts, follow 12 hour normal operations guidelines above	2 if greater than 12 hours in duration; extended shifts must be non-consecutive. If >2, follow 12 hour normal operations above

Recommendable contacts on the topic are:

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