EXHIBIT A

DRA
DIVISION OF RATEPAYER ADVOCATES

Contact: Cheryl Cox, Policy Advisor - cxc@cpuc.ca.gov - 415.703.2495

Proceeding: R.11-02-019 **Date:** July 2013

DRA Motion to Require a Comprehensive Quality Assurance / Quality Control Plan

DRA Position: The NTSB and IRP Reports determined that the San Bruno Explosion resulted, in large part, from PG&E's failure to have a Quality Assurance (QA) Plan with Quality Control (QC) procedures in place. PG&E's response to DRA's motion shows that PG&E is performing QC on an *ad hoc* basis and that it does not have a comprehensive QA/QC Plan in place. The Commission should order PG&E to prepare such plans immediately to ensure the safety of PG&E's current and future PSEP work.

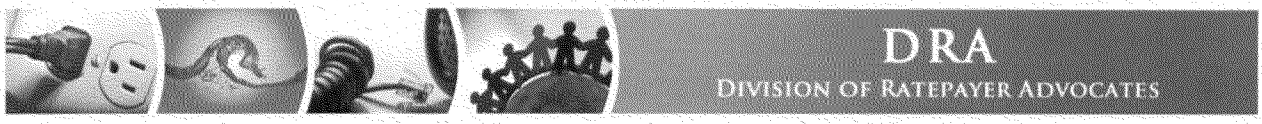
QA/QC Activities Guided by a Comprehensive QA/QC Plan Ensures Both Safety and Cost-Effectiveness

- In the context of pipeline safety, QA/QC plays a vital role:
  - **QA** activities aim to prevent errors through proactive planning.
  - **QC** activities aim to catch and correct errors that occur in spite of QA.
- A lack of adequate QA/QC was cited by the NTSB and the Independent Review Panel (IRP) report as factors contributing to the San Bruno explosion.
- QA/QC activities should be performed on the planning and engineering work during ***development*** of PSEP projects, as well as ongoing ***implementation*** of the PSEP.
  - Development is planning, engineering, and prioritizing projects.
  - Implementation is actually replacing or testing specific pipes.
- QA/QC activities should be guided by a comprehensive QA/QC Plan established in advance of work actually being performed.
- PG&E should be required to develop a QA/QC plan for all going forward work on its system in order to ensure the safety and cost effectiveness of that work.
- PG&E should be able to incorporate current QC activities into a QA/QC Plan.

DRA Discovery

- PG&E did not prepare a comprehensive QA/QC plan before starting the PSEP — as would be expected for a project of the PSEP's scale and from a company committed to developing a safety culture.
- PG&E is performing QC procedures on its PSEP design/prioritization and project costing work in an *ad hoc* fashion after the work is completed.
- PG&E fails to explain the QA/QC standards it is applying to determine whether the work has been done correctly.
- As of April 30, PG&E has completed or eliminated over 70% of proposed PSEP projects

(over)



DRA's Motion and PG&E Response

- DRA filed a Motion on July 8, 2013 requesting that the CPUC order:
  - PG&E to develop a comprehensive QA/QC Plan for all PSEP activities.
  - PG&E to perform QA/QC for all PSEP work consistent with the QA/QC Plan.
  - PG&E to document quality standards, procedures, results of QA checks, and how "sound engineering practice" will be achieved.
  - CPUC Safety and Enforcement Division (SED) review of QA/QC activities used by PG&E, except those related to PSEP costs.
- PG&E response to this Motion on July 23, 2013 stated that it will "describe and document" its QA/QC procedures in the pending Update Application, and that:
  - SED has been involved with MAOP Validation QA/QC since June 2011.
  - PG&E is in the process of developing QA/QC procedures which it will describe in testimony format in the Update Application.
  - PG&E's Project Management Office (PMO) is responsible for the accuracy and consistency of PSEP, including project design.
  - SED and its contractor have been involved with oversight of PSEP execution.
  - The flow chart of PSEP activities it provides is more accurate than DRA's flow chart.

DRA Conclusions

- DRA appreciates that there is evidence PG&E is performing after-the-fact quality control on some aspects of the PSEP work.
- DRA also appreciates that PG&E has committed to address some of DRA's concerns regarding QA/QC as part of the PSEP Update Application.
- However, retrospective documentation of QC activities is not a substitute for a proactive QA/QC Plan, and the Update Application is not the appropriate forum to address PG&E's QA/QC activities.
- The PSEP Decision D.12-12-030 authorized $28.9 million for a Program Management Office (PMO), in part, to pay for QA/QC activities.
- The Commission should order PG&E to prepare a comprehensive QA/ QC Plan for all going-forward PSEP activities and provide them for review as soon as practicable.
- The Commission should provide oversight of PG&E's QA/QC efforts independent of the pending updated PSEP application.
- The Commission should hold PG&E accountable for complying with its QA/QC Plan.
- PG&E's failure to embrace QA/QC and to develop legitimate QA/QC Plans demonstrate that it has not turned the corner to embracing a safety culture.

PG&E Pipeline Data & PSEP Update Reference Process Flow

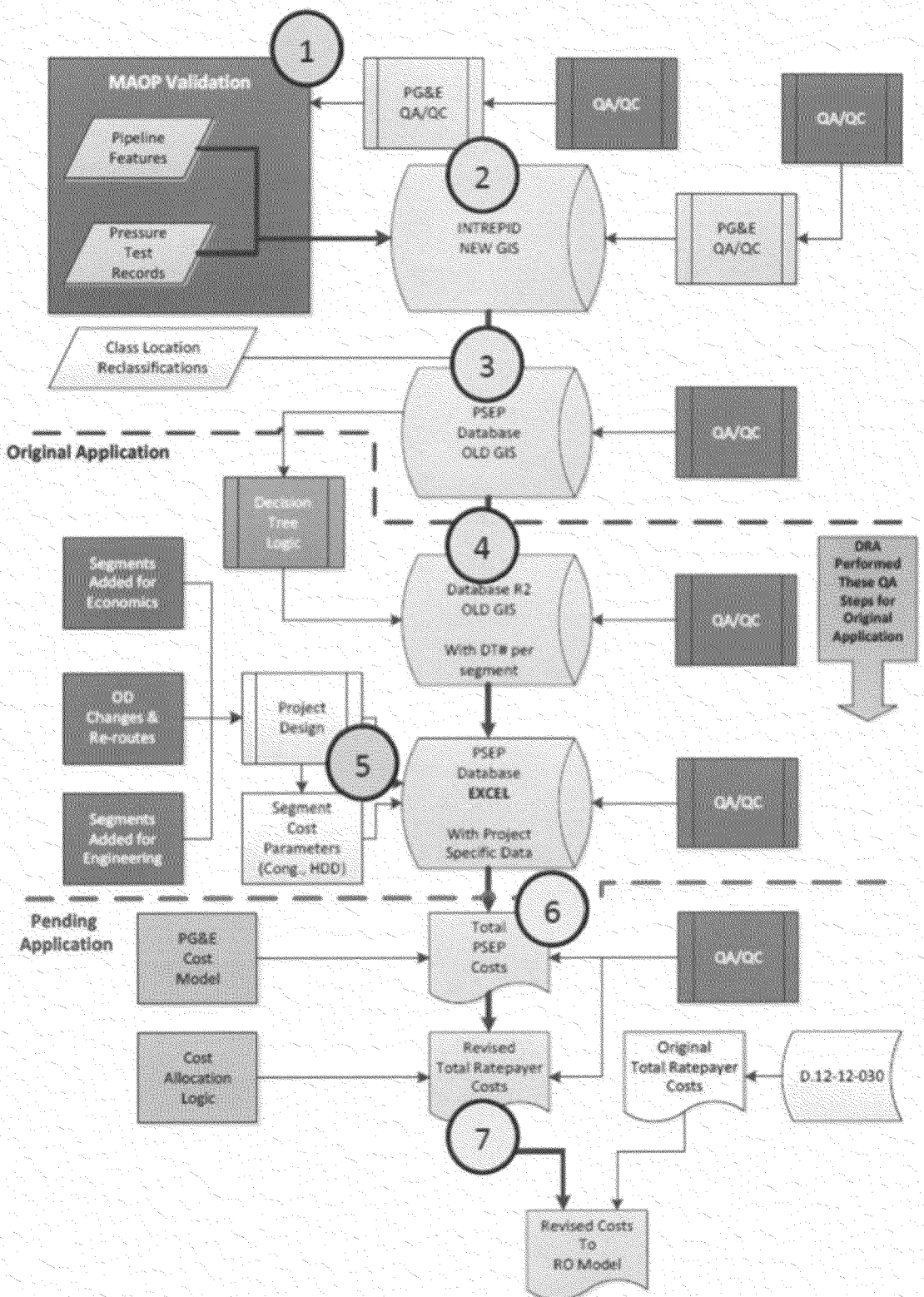


EXHIBIT B

Pacific Gas and Electric Company

James M. Welsch
Station Director

Diablo Canyon Power Plant
Mail Code 104/5/502
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Avila Beach, CA 93424

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Internal: 691.3242
Fax: 805.545.4234
Internet: JMW1@pge.com

August 2, 2012

PG&E Letter DCL-12-069

10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Submittal of Quality Assurance Plan and Revised Phase 1 Documents for the License Amendment Request for Digital Process Protection System Replacement

References:
1. PG&E Letter DCL-11-104, "License Amendment Request 11-07, Process Protection System Replacement," dated October 26, 2011 (ADAMS Accession No. ML11307A331).
2. Digital Instrumentation and Controls DI&C-ISG-06 Task Working Group #6: "Licensing Process Interim Staff Guidance," Revision 1, January 19, 2011 (ADAMS Accession No. ML110140103).
3. NRC Letter "Diablo Canyon Power Plant, Unit Nos. 1 and 2 - Acceptance Review of License Amendment Request for Digital Process Protection System Replacement (TAC Nos. ME7522 and ME7523)," dated January 13, 2012.
4. NRC Letter "Summary of June 13, 2012, Teleconference Meeting with Pacific Gas and Electric Company on Digital Replacement of the Process Protection System Portion of the Reactor Trip System and Engineered Safety Features Actuation System at Diablo Canyon Power Plant (TAC Nos. ME7522 and ME7523)," dated June 27, 2012 (ADAMS Accession No. ML12170A866).
5. Invensys Operations Management Letter, "Invensys Operations Management Letter Submittal to Support License Amendment Request from PG&E for Replacement of the Eagle 21 Process Protection System at Diablo Canyon Power Plant," dated October 26, 2011 (ADAMS Accession No. ML113190392).

Dear Commissioners and Staff:

In Reference 1, Pacific Gas and Electric (PG&E) submitted License Amendment Request (LAR) 11-07 to request NRC approval to replace the Diablo Canyon Power

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Plant (DCPP) Eagle 21 digital process protection system (PPS) with a new digital PPS that is based on the Invensys Operations Management Tricon Programmable Logic Controller, Version 10, and the CS Innovations, LLC (a Westinghouse Electric Company), Advanced Logic System. The LAR format and contents in Reference 1 are consistent with the guidance provided in Enclosure E and Section C.3, respectively, of Digital Instrumentation and Controls (I&C) Revision 1 of Interim Staff Guidance Digital I&C-ISG-06, "Licensing Process" (ISG-06) (Reference 2). In Reference 3, the NRC staff documented its acceptance of Reference 1 for review.

The PG&E Quality Verification group has developed the quality assurance plan document "Quality Assurance Plan for the Diablo Canyon Process Protection System Replacement". This plan is contained in Attachment 1 to the Enclosure and addresses the Open Item Number 27 contained in Enclosure 2 of Reference 4.

PG&E has revised the ISG-06 Phase 1 documents, "DCPP Units 1 & 2 PPS Replacement Functional Requirements Specification (FRS)" and the "DCPP Units 1 & 2 PPS Replacement Interface Requirements Specification (IRS)." The revised "DCPP Units 1 & 2 PPS Replacement FRS, Revision 5," and the "DCPP Units 1 & 2 PPS Replacement IRS, Revision 6," are contained in Attachments 2 and 3 to the Enclosure, respectively. These revised FRS and IRS documents supersede the documents previously submitted in Attachments 7 and 8 to the Enclosure of Reference 1, respectively.

Invensys Operations Management has created document "993754-1-916, V10 Tricon Reference Design Change Analysis," that addresses the impact of changes between Tricon version 10.5.1 and Tricon version 10.5.3. Tricon version 10.5.3 is intended to be installed for the Diablo Canyon PPS replacement. The Invensys Operations Management document "993754-1-916, V10 Tricon Reference Design Change Analysis, Revision 0" is contained in Attachment 4 to the Enclosure.

Invensys Operations Management submitted, in Reference 5, the following Invensys Operations Management ISG-06 Enclosure B Phase 1 Tricon documents to support Reference 1; "993754-1-802, Revision 1, Software Verification and Validation Plan," "993754-1-813, Revision 0, Validation Test Plan," and "993754-1-906, Revision 0, Software Development Plan." These Invensys Operations Management documents have been revised to address NRC comments contained in Enclosure 2 of Reference 4. The non-proprietary versions of the Tricon Software Verification and Validation Plan, Validation Test Plan, and Software Development Plan are contained in Attachments 5, 6, and 7 of the Enclosure, respectively, and the proprietary versions are contained in Attachments 9, 10, and 11 of the Enclosure, respectively. These revised Tricon documents supersede the documents previously submitted in Reference 5.

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This letter contains Invensys Operations Management documents contained in Attachments 9, 10, and 11 to the Enclosure that contain information proprietary to Invensys Operations Management. Accordingly, Attachment 8 to the Enclosure includes Invensys Operations Management Affidavit No. 993754-AFF-38T. The affidavit is signed by Invensys Operations Management, the owner of the information. The affidavit sets forth the basis on which the Invensys Operations Management proprietary information contained in Attachments 9, 10, and 11 to the Enclosure may be withheld from public disclosure by the Commission, and it addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR 2.390 of the Commission's regulations. PG&E requests that the Invensys Operations Management proprietary information be withheld from public disclosure in accordance with 10 CFR 2.390. Correspondence with respect to the Invensys Operations Management proprietary information or the Invensys Operations Management affidavit provided in Attachment 8 to the Enclosure should reference Invensys Operations Management Affidavit No. 993754-AFF-38T and be addressed to Roman Shaffer, Project Manager, Invensys Operations Management, 26561 Rancho Parkway South, Lake Forest, CA 92630.

If you have any questions, or require additional information, please contact Tom Baldwin at (805) 545-4720.

This information does not affect the results of the technical evaluation or the significant hazards consideration determination previously transmitted in Reference 1.

This communication does not contain regulatory commitments (as defined by NEI 99-04).

I state under penalty of perjury that the foregoing is true and correct.

Executed on August 2, 2012.

Sincerely,

James M. Welsch
Interim Site Vice President

kjse/4328 SAPN 50271918
Enclosure
cc: Diablo Distribution

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EXHIBIT C

August 6 2013

Subject: AMEC Quality Assurance Program

AMEC Environment & Infrastructure, Inc. (AMEC) is pleased to present information on our capabilities and qualifications.

COMPANY BACKGROUND

AMEC is a focused supplier of consultancy, engineering and project management services to its customers in the world's oil and gas, mining, clean energy, environment and infrastructure markets. With annual revenues of some $6.6 billion, AMEC designs, delivers and maintains strategic and complex assets and employs over 29,000 people in around 40 countries worldwide. See amec.com.

AMEC has an experienced and knowledgeable team that provides the depth of qualified resources, construction support experience, and strong understanding of the challenges associated with pipeline projects.

AMEC is a leading construction management, civil engineering and environmental services firm, with more than 8,000 employees in North America and more than 220 employees in Northern California. AMEC possesses the local resources necessary to deliver inspection services in a cost-effective, timely, and safe manner. Some of our successes on a number of key local pipeline and large construction projects are highlighted in Appendix A.

COMPANY EXPERIENCE

AMEC's national experience includes global energy provider, numerous utility companies, including nine nuclear plants and over 35 State DOTs. Our local experience extends to California Department of Transportation, Bay Area Rapid Transportation, SFPUC, and the Santa Clara Valley Transportation Authority. The most relevant local experience relevant to PG&E projects has been our work for the SFPUC conducting Quality Control and Quality Assurance Inspections.

QUALITY ASSURANCE CAPABILITIES

AMEC utilizes only personnel with appropriate training and certification to perform inspection and testing procedures. Nondestructive testing (NDT) personnel are certified in accordance with AMEC's Written Practice for Nondestructive Examination Procedures for Personnel Qualification and Certification. These written practices meet or exceed the requirements of SNT-TC-1A. Welding inspection services are performed by personnel that are qualified and certified in accordance with AWS QC1 as CWI. (See Appendix B for sample personnel resumes.)

Steel inspection and non-destructive testing is a core business of AMEC. Our technicians have experience providing Quality Assurance inspection of field welding on water transmission pipelines using AWWA, AWS, and ASME requirements. Our inspectors verify the welding quality control plan requirements as well as conduct visual and NDT inspections as required.

Welding successes and quality cannot be inspected into a structure. A well planned and complete procedure must be established and followed to achieve the desired results. Our team of engineers and inspectors know and understand this concept and recognize that ultimate success is achieved before and during welding and that final inspection should be a confirmation of correctly implemented procedures executed by a skilled craftsman. This can only be accomplished by following the pre-developed procedures including a properly prepared weld joint that is acceptably clean, with acceptable

Correspondence:
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2101 Webster St, 12th Floor
Oakland, CA 94612
Tel +1 (510) 663- 4100
Fax +1 (510) 663-6360
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fit-up and welded within the established welding procedure (WPS) parameters by properly trained and certified welder.

AMEC inspectors also understand the importance of accurate, timely and thorough reporting. AMEC inspection reports are reviewed by a Senior Technician or Engineer to ensure they meet the project requirements. For example, AMEC developed customized reports for the SPFUC Bay Division Pipeline #5, a project where inspection reports had previously been insufficient to address welding issues when they arose (see Appendix A, first project, for additional information).

MATERIAL ENGINEERS AND EXPERT SUPPORT

AMEC's experts provide a direct link to national committees and cutting edge developments in Steel, Welding, and NDT. When an issue arises, AMEC can provide specification and code interpretations providing all involved with intent and solutions to avoid delay or claims. AMEC has members on key national committees for steel and welding:

- Committee Member AWS D1 Main Committee
- Committee Member AWS D1 Subcommittee: 4 Inspection
- Committee Member AWS D1 Subcommittee 9 Reinforcing Steel (Chairman)
- Committee Advisory Member AWS D1.1 Task Group on Seismic Issues
- Committee Advisory Member AWS D1.5 Subcommittee 10 Bridge Welding

AMEC has developed auditing procedures, audit questions and checklists; trained technical auditors for clients and conducted audits in numerous facilities throughout the United States and around the world. We have conducted over 40 audits at fabrication, casting, wire facilities, concrete precast and batch plant facilities in support of the large construction and retrofit projects.

LABORATORY TESTING SERVICES

If needed, AMEC can provide lab testing services for an extensive list of test methods and standards. Clients include many large scale projects on state, local and Federal projects and nuclear plants for over the last 60 years. AMEC has a fully accredited AASHTO laboratory in San Diego and partners in the Bay Area for local testing as well.

Thank you for the opportunity to provide information on our company. We look forward to a favorable review and the opportunity to meet and discuss any opportunities with you. Please do not hesitate to contact Aaron Franklin at (858) 699-0513 or Francis Wiegand at (858) 514-5423 regarding this letter.

Sincerely,
AMEC ENVIRONMENT & INFRASTRUCTURE, INC.

Aaron Franklin, PE
Project Manager / Principal Engineer

Francis Wiegand, PE
Principal Program Manager

Attachment:

A. Example Projects
B. Personnel Resumes
C. Example QA Plan TOC for a local agency
D. AMEC capabilities placemat

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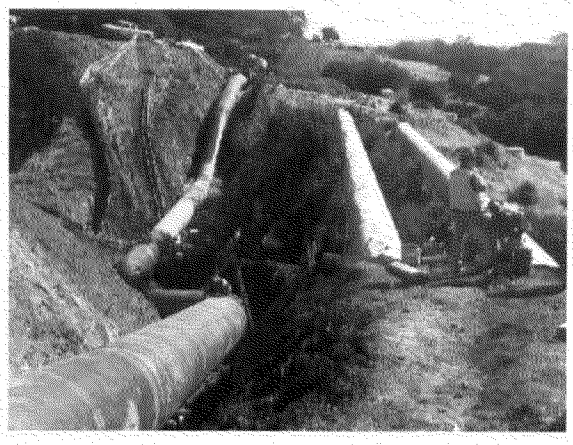
A. EXAMPLE PROJECTS

WD-2542 Bay Division Pipeline (BDPL) Reliability Upgrade, Pipeline No. 5 – Peninsula Reaches, Mountain Cascade Inc. SFPUC, 2011-2012

AMEC performed welding quality control inspections and materials engineering for Mountain Cascade Inc (MCI). AMEC tasks included:

- 3 QC Inspectors (CWI, UT-II, MT-II) for welding 8 miles of pipeline
- Individual inspection reports for every joint
- Joint inspection tracking
- Welding procedure development
- Welder certification documentation
- Welding related RFI's



Final inspection, CJP on 14" wide backing strap

Project Background: Approximately half of the pipe had been installed when the SFPUC stopped work on the piping due to discrepancies in the welding inspector reports and concerns for weld quality. SFPUC's Regional Construction Manager Ben Leung referred AMEC to MCI as an expert resource. AMEC cataloged all the existing available welds and developed a repair plan. AMEC inspectors oversaw repair of existing welds and welding of all new welds.

Highlights

- **Critical project issues require a firm that is proactive, solution oriented, and able to team with the Contractor and the Owner.** – AMEC's Principal Welding Engineer worked closely with the MCI to assess the situation and provide a clear path forward that would be acceptable to the SFPUC.
- **Ability to provide real-time solutions to accelerate the project and minimize delays.** – AMEC provided Licensed Engineers and CWI's onsite as needed to collect measurements on the existing welds and develop a repair plan to address the SFPUC's concerns.
- **AMEC tracking and reporting.** – AMEC tracked all welding and inspections, and provided thorough reporting that will withstand future scrutiny.
- **Project Owner and reference** San Francisco Public Utilities Commission, Ben Leung, Regional Construction Manager, 415-554-1887

Measurement of interior and exterior fillet welds.

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University Mound Reservoir North Basin Seismic Upgrades, San Francisco Public Utilities Commission. 2009-2011.

The construction project consists of seismically retrofitting the roof of the University Mound Reservoir North Basin to withstand a major seismic event. This structure is a water reservoir serving half of the city of San Francisco. The project includes improving the reservoir walls and roof with seismic joints, shear walls, diagonal bracing and brackets, and foundation improvements. Key items in the retrofit include fabricating and installing the stainless steel tubular roof support braces and brackets. There were 1,400 feet of tubular braces manufactured at Bristol Metals in Bristol Tennessee and associated brackets that were fabricated at Olson Steel in San Leandro, California. AMEC supported the SFPUC by serving as the "Owner's Testing Agency" for onsite and offsite inspections, deploying inspectors to Tennessee and throughout California and at the jobsite as well. AMEC inspection services included verification of material, verification of fabricator's quality control program, ultrasonic testing of complete joint penetration welds, and concrete inspection at the jobsite. AMEC provided welding and fabrication recommendations to the SFPUC. AMEC also conducted an audit assessing the capabilities of the primary fabricator Olson Steel.

- **AMEC saves the project time and money by auditing key steel fabricator.** When it was determined that the fabricator did not have a required certification, AMEC provided the SFPUC an alternative solution to restarting the project with a new fabricator. AMEC developed and conducted a project specific audit to verify the capabilities of the existing fabricator. AMEC provided a comprehensive audit report and recommendation which was used by the SFPUC to approve the fabricator.
- **AMEC smartly deploys inspectors where and when they are needed.** AMEC leveraged its national presence to save the client costs. AMEC utilized qualified inspectors from nearby offices in Alabama to cover inspection of the tubular braces manufactured in Tennessee. This cut travel time and travel costs in half compared to deploying an inspector from California.
- **AMEC welding and fabrication experts make a difference.** SFPUC engineers relied on AMEC experts for recommendations to tough technical welding and fabrication issues.

Project Reference: Ben Leung, SFPUC Regional Construction Manager, 415-554-1887

View of the interior of the Reservoir during the retrofit.

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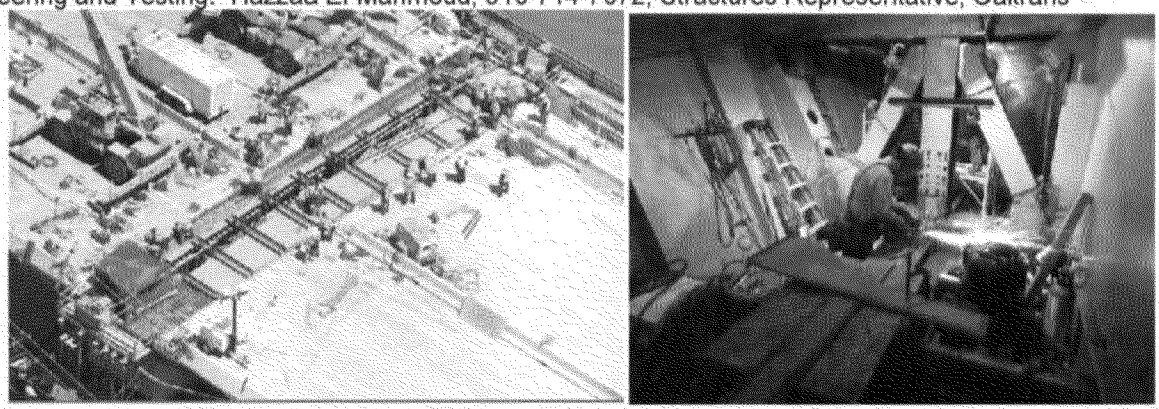
Seismic Retrofit of the Antioch and Dumbarton Bridges for the California Department of Transportation, 2010-2013

AMEC provided materials engineering, inspection and testing services for the Caltrans Seismic Retrofit projects on the Dumbarton (1.6 miles long) and Antioch Bridge (1.8 miles long). AMEC conducted QA inspection and testing to verify that contractor QC activities are being performed and materials are being produced in accordance with project specifications, at fabrication facilities in Arizona, Washington, South Korea as well as at the jobsites. Items inspected included structural steel fabrication and welding, PC/PS concrete piles, fasteners, and bearing pads. Conducted Ultrasonic and Magnetic Particle testing on welding. Witnessed shop and field painting operations. Inspected Friction Pendulum Isolation Bearings and documented QC and QA laboratory testing.
Project Reference: Keith Hoffman, 510-376-7627, Office of Structural Materials Branch Senior, Materials Engineering and Testing. Hazzaa El-Mahmoud, 510-714-7072, Structures Representative, Caltrans



Aerial Photograph of Dumbarton bridge work during 2012 Memorial Day closure (left) and welding inside bridge.

Materials Inspection and Testing Services for California Department of Transportation, Northern and Southern California Districts, 2005-2011

AMEC performed for Caltrans a variety of engineering support services for concrete and steel inspection and testing at the jobsite and at the source of supply for Caltrans. AMEC provided steel and concrete inspectors and Structural Materials Representatives to the Caltrans Office of Structural Materials. Project services included conducting technical meetings (preconstruction, prejob, pre-welding, pre-fabrication and status meetings), review of contract plans and specifications, responding to RFIs, quality control manual reviews, and inspection resource management. Inspection and testing services included welding inspections by AWS CWI certified personnel, precast concrete plant inspections by PCI Level II certified personnel, nondestructive testing of welding by UT, MT, RT Level II certified personnel and Source (point of fabrication) Inspection (steel piling, CISS piling, PS/PC concrete piles, sign structures, fasteners, and pole structures).
Project Reference: Keith Hoffman, 510-376-7627, Office of Structural Materials, Materials Engineering and Testing Services, Caltrans

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B. RESUME HIGHLIGHTS

Kevin Carpenter, AMEC Level III/II, CWI / NDT– Welding Quality Control Manager. As a Senior Inspector and AMEC Level III in UT & MT, Mr. Carpenter has over 24 years of experience in materials testing and fabrication inspection. Kevin has worked in QCM roles on projects throughout the Bay Area, to include the Bay Division Pipeline #5, the SFOBB, and the Dumbarton Seismic Retrofit.

Chuck Patrick –CWI / NDT. Mr Patrick has experience in quality assurance and quality control inspection, materials source inspection and non-destructive testing. Mr. Patrick has performed inspection of structural members on water transmission pipelines, major bridges, and steel structures. For 13 years, Mr. Patrick worked at Napa Pipe as QC of fabrication and UT of large diameter pipe for oil and gas lines. Mr. Patrick inspected both at jobsites and fabrication facilities in accordance with AWS D1.1, D1.5 and AWWA, and ASME.

Bruce Berger, AMEC Senior Level III/II, CWI / NDT. Mr. Berger is a Level III in MT, PT, UT, and RT disciplines, non-destructive testing technician and inspector with over two decades of experience in the construction and industrial sectors, performing non-destructive testing (NDT) and quality assurance inspection. He has written inspection procedures to numerous codes, including ASME, AWS and AWWA. He has performed inspections and NDT testing for clients of piping, structural steel in bridges and buildings, and overhead sign structures.

Aaron Franklin, PE – Quality Assurance Inspections Manager. Mr. Franklin is an experienced principal engineer with client relationship and project management experience. Mr. Franklin has led inspection and testing programs during the construction of major construction projects for private and government clients. He has extensive work and consulting in materials engineering, materials inspection, cost estimating, and management of engineers and engineering technicians. He has served as a consultant to clients in trouble-shooting materials problems, review of appropriate codes including: PCI, AWS, ASME, API, AWWA and other international codes, specifications and detail drawings, and in providing recommendations for quality assurance and testing programs. He has provided technical recommendations on all aspects of structural materials during construction. Prior to joining AMEC, Mr. Franklin was an Engineer Officer for four years with the U.S. Army Corps of Engineers.

Jim Merrill, PE – Principal Welding Engineer. A registered metallurgical / professional engineer, Certified Welding Inspector, and Non-Destructive Technician, Mr. Merrill has project management experience conducting welding inspection programs for numerous state DOT bridge construction and rehabilitation projects and other facilities throughout the U.S. He is an AMEC Senior Principal Welding Engineer. Inspection services have included examination of weldments by non-destructive and visual methods, bolted connection examinations, and other fabrication and erection testing. Mr. Merrill has served as a consultant to clients in trouble-shooting welding problems, development of welding procedures, review of appropriate codes, specifications and detail drawings, and in providing recommendations for quality control and testing programs. Mr. Merrill has extensive experience writing and reviewing welding procedures, performing audits of fabrication facilities, welding inspections, materials evaluation, cost estimating and management of engineers and engineering technicians.

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C. Example QA Plan TOC for a local agency

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Source Inspection Quality Management Plan

I-880/Stevens Creek Interchange Improvements

Project No.: C12048F

Caltrans EA: 04-445604

Prepared for:

Caltrans Materials Engineering and Testing Services (METS) Attention:

Caltrans Oversight Structural Materials Representative

November 16, 2012

Prepared by:

Santa Clara Valley Transportation Authority

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D. AMEC capabilities placemat

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Quality Assurance: Critical to Project Success

3177 Sky Park Court, San Diego, California 92123
www.amec.com

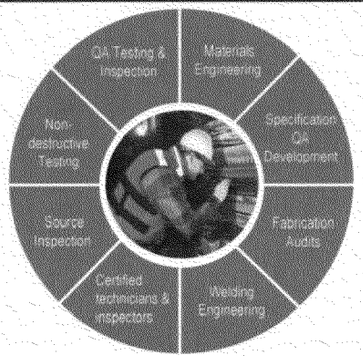
Our business by the numbers
Environment & Infrastructure

Annual Revenue You're partnering with a team that has extensive engineering experience	$6.6 billion
Depth of Resources Our employees provide innovative solutions using unmatched expertise and uncompromising integrity	29,000
Years in Business We meet the demands of today's complex global engineering and environmental projects	160
Safety is Paramount Our commitment to 'Beyond Zero' safety culture continues without occupational illness or injury	.53 EMR
Cost Savings Delivered Our unwavering commitment to quality, efficiency, and cost-effective solutions has led to billions in client savings	$1+ billion

Quality assurance best practices
Winning programs, procedures and technologies

- Value engineering
- Safety Culture
- Proactive Approach
- Prequalification of Fabricators
- Site Audits
- Specification Review
- Cross-trained staff
- Materials engineers
- Proactive mitigation of issues
- Source inspection
- Experience with all domestic and most global manufactures

Quality assurance services
Covering a broad range of transportation activities



Sectors and service capabilities
Quality assurance across all services

Full-suite of services

- Energy and Sustainability
- Environmental Monitoring
- Permitting/ Compliance
- Materials Forensics
- Nondestructive testing
- Geotechnical / Geology
- Construction Management
- Materials Testing& Inspections
- In-House/Mobile Laboratory
- Quality Assurance Plans

Energy

Government

Industrial/ Commercial

Mining

Oil & Gas

Transportation

Water

Qualifications
Employee certification and licenses

Steel inspection and non-destructive testing is a core business of AMEC. Our technicians have experience providing Quality Assurance inspection of field welding on water transmission pipelines using AWWA, AWS, and ASME requirements. Our inspectors verify the welding quality control plan requirements as well as conduct visual and NDT inspections as required.

- **Registered Civil / Metallurgical/ Mechanical Electrical Engineers – Certified Technicians**
  - QA, Schedule Management
- **Fabrication Experience**
  - Steel / Precast Concrete
    - AWS/ ASNT/ NACE
    - PCI ACI
- **National Committee Members**
  - AWS D1 Committee and Sub Committees
- **Certified ASNT / AWS Technicians**
  - AWS Welding Inspections (CWI)
  - NDT Level II and III
  - NACE Level II and I
- **Competent Trade Specialists**
  - Certified Power Linemen
- **25 years average inspection experience**

Laboratory capabilities
Largest AASHTO accredited lab in Southern California

We are capable of providing all the required testing in-house to reduce delays and increase responsiveness. We have a proven history of meeting turn-around times on all testing to support needs.

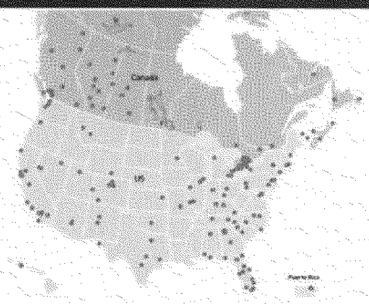
The agencies below have inspected and accredited our laboratories.

PROGRAM	AGENCY	ACCREDITATION/ CERTIFICATION
Accreditation	AASHTO, National Institute of Standards & Technologies (AMRL)	1991 - Present
Certification	Cement and Concrete Reference Laboratory (CCRL)	1987 - Present
	DSA	1985 - Present
Sample Proficiency Program	City of San Diego	1985 - Present
	CCRL	1987 - Present
	AMRL	1991 - Present
	Caltrans - Reference Sample Program	1987 - Present
	Asphalt Pavement Association California Round Robin Proficiency Test	1996 - Present

Proven experience
Clients we support

NVEnergy, aps, TXU energy, LS Power, First Solar, SCE, Southern California Edison, PG&E, Southern Company, nalcor energy, Exelon, Dominion, Duke Energy, SCANA Energy, SDGE, Progress Energy, Sempra Energy utility, PSEG

North American presence
Where you need us, when you need us



AMEC is an industry-leading infrastructure engineering, environmental consulting, and construction services company with more than 8,000 professionals in the United States.

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Quality Assurance: Critical to Project Success

3177 Sky Park Court, San Diego, California 92123
www.amec.com

amec

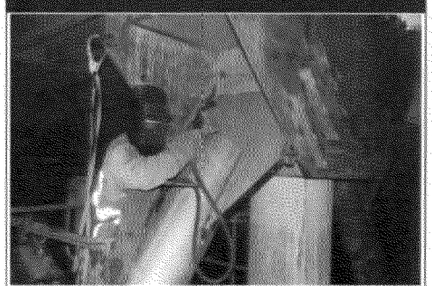
Bay Division Pipeline
San Francisco Public Utilities Commission

- 3 QC Inspectors (CWI, UT-II, MT-II) for welding 8 miles of pipeline
- Materials Engineering
- Individual inspection reports for every joint
- Joint inspection tracking
- Welding procedure development
- Welder certification documentation
- Welding related RFI's

Green Build (Terminal 2)
San Diego County Regional Airport Authority

- $1.5B project with aggressive schedule
- Structural Steel Erection
- Cost concerns
- Lack of QA/QC
- Cross-trained staff reduced effort -- Delivered 21.5 % under budget
- State-of-the-Art Equipment reduces effort

North Basin Seismic Upgrades
San Francisco Public Utilities Commission



- Owner's Testing Agency" for onsite and offsite inspections
- Deploying inspectors to Tennessee and throughout California
- Verification of material and fabricator's quality control program
- Ultrasonic testing verification of complete joint penetration welds; and concrete inspection at jobsite

Mobile Testing Labs & Inspection
Mitigating risk to ensure no costly delays

Qualified Resources

- Qualified licensed structural, welding, and metallurgical engineers
- 20 years average QA/QC inspector level of experience

Testing Capabilities

- Soils
- Aggregates
- Asphalt
- Concrete
- Masonry
- Reinforcing Steel
- Bolting
- Petrography
- Non-destructive testing
- Chemistry

Testing Equipment

- Pavement skid testing equipment
- Marshall testing equipment
- Balances and scales
- Load frames
- Ovens/hotplates
- Proving rings/load cells
- CBR apparatus
- Consolidometers
- Direct shear device
- Sieve shakers and sieve sets
- Vibratory compaction table
- Permeameter cells
- Liquid limit devices
- Asphalt binder testing equipment
- Non-destructive testing equipment for concrete and Steel
- Triaxial shear cells
- Triaxial shear machines
- Triaxial / permeability / consolidation panel boards
- Hamburg wheel tracking devise
- Testing machines -- compression
- Testing machines -- flexural
- Testing machines -- universal (constant strain)
- Testing machines - universal (tension / compression)
- Knowledge of Caltrans paving changes
- Concrete and aggregate petrography equipment
- Dynamic soil testing (cyclic triaxial, resonant column, etc.)

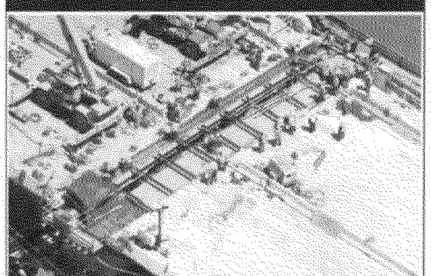
Sunrise Powerlink
SDG&E

- A $1.9B utility project crossing the interstate five times
- 119-mile high-voltage transmission using 438 tower sites
- Extreme weather and sensitive environmental conditions
- Limited environmental impact
- No accidents or incidents
- Responsive to project dynamics
- Innovative pile cap design
- 2.5% savings delivered

One Nevada (ON) Line
NV Energy

- Enables the development of numerous renewable energy projects in Nevada
- 25M pounds of steel
- 231-mile long line, 500kV
- Highly complex design
- QA/QC Inspections
- Shop fabrication inspection
- Weld inspections
- Materials and NDT testing

Seismic Bridge Retrofit Program
Caltrans Statewide



- $8 billion program consisting of 2,200 bridges statewide
- Quality Assurance Inspection
- Nondestructive Testing
- Concrete and steel inspection
- Fabrication shop inspection
- Review welding procedures
- Visual inspection of base metal surfaces and edges and for dimensional conformance

SB_GTAS_0367930

EXHIBIT D

Sample

Quality Assurance Plan

109 Shirmac Drive
Slidell, LA 70461
(985) 781-9800

24 August 2010

SB_GT&S_0367932

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Sample Quality Assurance Plan

Introduction

This Sample Quality Assurance Plan (QAP) details the process used to monitor and evaluate adherence to processes, procedures, and standards to determine potential product and service quality for projects that AES undertakes. AES will develop a quality assurance plan for each project or task order issued. Development of these QAPs involves the review and auditing of the processes and activities to verify that their performance complies with the applicable procedures and standards, and assures the appropriate visibility for the results of the reviews and audits.

Quality Assurance (QA) activities will be an integral part of all project functions. While more will be developed to match each project or task order, this sample QAP addresses the following examples of support activities:

- Project Planning
- Network Administration and Operations
- Problem Tracking and Reporting
- Hardware/Software Configuration Management
- User Training
- Telecommunications

Purpose

The purpose of the QAP is to guide the establishment of Quality Assurance (QA) activities within the processes and procedures used to deliver products and services within the environment. A robust QA plan will provide confidence that products and services are developed and delivered according to established processes and are of the highest quality. It defines the policy for QA activities, the organizational structure and responsibilities of the QA group, and identifies necessary reviews and audits. This plan should be tailored by each project or task order to fit specific activities.

Policy Statement

All activities are required to include QA activities as an integral part of the processes used for the development and delivery of products/services. This policy requires that:

- QA goals must be rational so that they are accepted and supported.
- Continual improvement efforts must be supported.
- All quality control and quality measurement activities are documented.
- A manager or management team will be responsible for QA.
- Senior management will review QA activities.
- The QAP will be baselined and placed under Configuration Management (CM) control.
- The QA Team will work to foster constructive communication, provide feedback to detect and prevent development problems, control risks, discuss alternative solutions, and ensure quality is built-in to all products/and Information Technology (IT) services to the customer.

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Scope

The scope of this plan covers the an example network and Data Center activities as well as Help Desk and Computer Support. This QAP addresses the following QA topics:

- Organizational structure
- Documentation required
- Procedures to be enforced
- Audits and reviews to be conducted
- Process improvement
- Problem reporting and resolution
- QA metrics

The example activities that will be reviewed by QA activities are:

- Project Planning
- Network Administration/Operations
- Computer Support
- Problem Tracking and Reporting
- Hardware/Software CM
- Training
- Help Desk

Management

Organizational Structure

The QA function will be a separate entity and will maintain independence from the individual Project functions by possessing a direct reporting relationship to management. This structure will protect the independence and objectivity of the QA Team and provide assurance of high quality, professional products and services. The QA Team is responsible for the development of the final QAP that will be used to identify its roles and responsibilities.

Roles and Responsibilities

The role of the QA team is to assist the technical staff to continually improve the quality of its work products and services. The QA Team is responsible for facilitating the establishment of the processes and procedures that Project Team members follow as they perform their day-to-day activities. The QA Team will perform periodic inspections and audits to ensure compliance with established policies and procedures.

The QA team will be involved throughout the life of the Project or task order. It will participate in the development of the Project Management Plan (PMP), and the Phase I Transition Plan to establish its function within the project and to provide input into the project schedule and Work Breakdown Structure (WBS). To ensure that QA activities are identified and that time is allotted for QA activities funding for the QA Team will be planned for within the task hours and cost structure available for the Project.

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Project Manager

The Project Manager (PM) will:

- Provide management support, supervision, and oversight for the QA function.
- Ensure the independence of the QA function.
- Make staff available and other resources as needed to support QA.
- Ensure resolution of problem and concern issues.
- Review QA audits and reports.

Sub-Project Manager

The Sub-Project PMs will:

- Manage individual project performance (i.e., Common Operating Environment (COE), Operations and Maintenance (O&M), Chargeback, etc.).
- Ensure QA activities are conducted.
- Ensure compliance with the QA project.
- Ensure responses to deficiency reports from QA reviews and audits.

Quality Assurance Team

The QA Team will:

- Develop and maintains the QAP.
- Conduct audits and reviews.
- Ensure work products adhere to the appropriate standards.
- Develop audit and review procedures for activities.
- Ensure QA processes and procedures adequately control project quality.
- Ensure QA activities accurately measure the product, service and process quality.
- Review and approves specified deliverables for release to customers.
- Promptly reports results of audits to the Project Task Leader.
- Periodically reports unresolved noncompliant items to senior management.
- Maintain an ongoing dialogue with the support staff.
- Ensure that the expectations of QA activities are identified and understood by the Task Leader and the team members.
- Collect and analyzes metrics produced from the results of the QA process.
- Recommend changes in procedures to improve processes.

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Project Team Members

The Project Team members will:

- Implement task level quality control based on QA standards, policies, and procedures.
- Participate in reviews and audits.
- Perform corrective actions or process improvements in response to QA findings.
- Manage and controls defects/errors and corrections.
- Track the status of defects/errors until closed.

The effectiveness of QA Team efforts depends on the support and commitment of the Project Member Team and all levels of management. All affected groups should be trained in the principles of QA and be committed to the proper inclusion and performance of QA activities in their work efforts.

Required Documentation

All required documents for the Project will follow the appropriate standards concerning content and format. When industry standards are not available, the QA Team, along with input from the Sub-Project Team, must develop the standards or adapt documents developed by other groups to use as standards within the Project. The information used from other groups' documents will be used to ensure compatibility between other standards existing within the organization. Standards will be identified and followed for all required project documentation.

The activities are to be implemented according to customer requirements. Documentation is necessary to ensure activities are planned, monitored and controlled as per customer requirements. This documentation will also be used to verify that the actual processes and procedures used to develop and/or deliver products/services are adequate. Documentation may need to be developed for specific tasks when it is unavailable from other sources. For example, specific documentation for hardware and software repair may be needed in certain circumstances and should be referenced by team members in the performance of their daily work.

Quality Assurance Procedures

Different methods and techniques will be utilized depending on the specific QA activity. The techniques, tools, and procedures that will be used are:

- Walkthroughs - Formal or informal, structured walkthroughs are used for orientation, examining promising ideas, identifying defects or errors, and improving products at any stage in the process.
- Reviews - An independent evaluation of an activity or process to assess compliance with the Project Plan or to examine products or processes against quality factors through the use of checklists, interviews, and meetings.
- Audits - An independent examination of a work product or process to determine compliance with specifications, standards, contractual agreements, or other pre-established criteria.
- Evaluations - An evaluation activity that examines products/services to determine compliance to customer requirements.
- Process Improvement - A process improvement project designed to reduce the error rate in a process.

QA will provide an independent review of the processes used at key check points. These reviews will seek to identify risks early, and will simplify monitoring and managing problem areas throughout the project. Due to the dynamic nature of activities, and the need to provide quick response requests, the QA

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Team will identify the sign-off points at key check points of an activity to ensure that expressed goals and requirements are met.

Walkthrough Procedure

Walkthroughs are beneficial for evaluating plans, documentation and other deliverables and serve to orient staff members to new technology products and services. Walkthroughs will be conducted internally and on an as-needed basis. They will be used to:

- Present plans, documentation, or other deliverables for review and approval.
- Review material in the preparation stages.
- Critique and report quality deficiencies of plans, processes, and procedures.

Walkthroughs will be scheduled early enough in a process to allow for revisions if problems are identified. Records of these walkthroughs will be maintained, along with issues that were identified and the resulting action taken. Issues can be accepted "as is" or may require more work. If further discussion on the issue is required, additional Walkthroughs can be scheduled.

Review Process

Reviews are important to assess compliance with a project plan. Specifically, the review process examines products/services within a quality factors context. Quality factors are categories of product/service attributes. Examples of quality factors include:

- Correctness - The extent to which a product/service satisfies the customer requirements and the stated objectives.
- Timeliness - The product/service is provided when needed to the customer.
- Reliability - The extent to which a product functions accurately or service is provided on a consistent basis.
- Productivity - The amount of resources needed to correctly produce the product or deliver the service, including the relationship between the amount of time needed to accomplish work and the effort expended.

Review Procedures

The QA Team will plan and conduct a review according to accepted practices and standards. A typical review procedure includes:

- Identification of reviews in the WBS and project schedule.
- Verification that correct review procedures are in place.
- Document review results against quality factors:
  - Verification of product/service traceability, if applicable.
  - Verification of product/service against contractual requirements.
  - Verification of product/service against standards and procedures.
- Validation of corrections by scheduling follow-up actions and reviews.
- Validation that defects or errors are tracked to closure.
- Documentation that review results against product validation information.

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- Summary of review findings for other technical groups/organizations (e.g., network engineering).
- Enhanced review procedures.

Audit Process

The QA Team will conduct process audits periodically as required by the customer and/or the SAMPLE Project. The purpose of audits is to identify deviations in process performance, identify noncompliance items that cannot be resolved at the technical support or project management level, to validate process improvement/corrective action achievements, and to provide relevant reports to all management levels.

A product audit is an independent examination of work product(s) to assess compliance with specifications, standards, customer requirements, or other criteria. Product audits are used to verify that the product was evaluated before it was delivered to the customer, that it was evaluated against applicable standards, procedures, or other requirements, that deviations are identified, documented and tracked to closure, and to verify corrections.

A process audit is a systematic and independent examination, to determine whether quality activities and their related results comply with planned arrangements, and whether these arrangements are implemented effectively and are suitable to achieve SAMPLE objectives.

The QA Team will perform the following activities when conducting an audit:

- Define the scope and purpose of the audit within the audit plan.
- Prepare audit procedures and checklists for the audit.
- Examine evidence of implementation and controls.
- Interview personnel to learn the status and functions of the processes and the status of the products.
- Discuss findings with the Technical Staff and Task Leader.
- Prepare and submit an audit report to the Technical Monitor/Senior Management.
- Refer unresolved deviations to the Technical Monitor/Senior Management for resolution.

Audit Procedures

A typical audit will include the following steps:

- Clearly understand and adhere to the audit scope.
- Conduct preparation meetings in advance of the audit:
  - a. Define areas to be reviewed.
  - b. Define review criteria.
- Conduct an overview meeting in advance of the audit.
- Develop an understanding of SAMPLE Sub-Project organization, products, and processes.
- Conduct the planned meetings, interviews, Samples, etc.
- Review the preliminary findings internally with the audit team.
- Verify and classify findings from the audit.
- Validate audit findings with the audit recipient.
- Prepare the audit report for the audit client.

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- Provide recommendations on request only.
- Follow-up on corrective action/process improvement.
- Improve the audit process.

An audit is considered complete when:

- Each element within the scope of the audit has been examined.
- Findings have been presented to the audited organization.
- Response to draft findings have been received and evaluated.
- Final findings have been formally presented to the audited organization and initiating entity.
- The Audit Report has been prepared and submitted to recipients designated in the audit plan.
- Audit findings have been documented, and recommendations and the Audit Report have been forwarded to the PM.
- A recommendation report, if required by the plan, has been prepared and submitted to recipients designated in the audit plan.
- All of the auditing organization's follow-up actions included in the scope of the audit have been performed.

Evaluation Process

Evaluations examine the activities used to develop/deliver products and services, ultimately determining if the activity is fulfilling requirements. The QA function establishes criteria for an evaluation, verifies the process has been performed, and collects the metrics to describe the actual results of those activities.

Process Improvement

The SAMPLE Project Team members are responsible for continuous process improvement. However, the QA Team is ultimately responsible for facilitating process improvement by providing the means and mechanisms to do so in an efficient and cost-effective manner. Process improvement is successful when an effective process emerges or evolves that can be characterized as: practiced, documented, enforced, trained, measured, and improvable.

A corrective action plan must be developed when a deficiency in the process is detected. Corrective action should prevent the problem from recurring.

The steps for implementing a process improvement approach are:

1. Detection of quality-related problems
2. Identification of responsibility
3. Evaluation of importance
4. Investigation of possible causes
5. Analysis of problem
6. Preventive action
7. Process controls
8. Disposition of nonconforming items
9. Permanent changes

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The QA Team will analyze the results of their findings in relation to the results of the documented processes used to produce products or services. This comparison will be used to determine which process may need improvement and to determine the effectiveness of changes to the processes. This comparison will also be used to identify best practices that should be continued or implemented at other sites.

Problem Reporting Procedures

Errors, defects, issues, deviations and noncompliance items identified in SAMPLE activities must be itemized, documented, tracked to closure, and reported by the QA Team. The QA Team must verify all problems were tracked to closure and must provide continuing feedback to management and the Technical Support Team about the status of the problem.

Noncompliance Reporting Procedures

The appropriate escalation of a problem for resolution is:

- Problems are resolved with the appropriate Task Leader, when possible
- Problems that cannot be resolved with the Task Leader are elevated to the Sub-Project PM
- Problems that have been referred to the Sub-Project PM are reviewed weekly until they are resolved. Items that cannot be resolved by the Sub-Project PM within six weeks are elevated to the SAMPLE PM for resolution

Quality Assurance Metrics

The QA Team will work with the Technical Support Staff to identify indicators and their associated measures (metrics) that are needed to control performance and predict the future status of processes used to produce products and services. The metrics will be used to help determine when and where a problem is occurring and what type of impact it will have on the product or service. The metrics will be used to base decisions concerning the selection of best practices to implement in the project.

Metrics that are necessary to monitor the effectiveness of QA processes and procedures are:

- Number of reviews (QA activities) conducted
- Status of non-conformance items identified
- Status of action items open/closed/on-hold
- Number of days to correct and close a non-conformance item
- Customer satisfaction levels relating to product and service quality
- Trends for process improvement
- Lessons learned

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Appendix - Quality Assurance Check Lists Forms

Quality Assurance Management Plan

Yes	No	Check List Description
___	___	Are project tracking activities evident?
___	___	Are project tracking and oversight being conducted?
___	___	Are all plan reviews conducted according to plan?
___	___	Are all issues arising from peer reviews addressed and closed?
___	___	Are status and review meetings conducted according to the schedule?
___	___	Is a WBS that supports all deliverables/long term projects developed?
___	___	Is change managed according to the Configuration Management Plan?
___	___	Have all deviations from standards and procedures documentation been approved?
___	___	Are project roles and responsibilities defined?

Quality Assurance Configuration Management

Yes	No	Check List Description
___	___	Does a Configuration Management Plan (CMP) exist?
___	___	Is the CMP being used?
___	___	Does the CMP contain a list of configuration items to be managed?
___	___	Does the CMP contain change control procedures?
___	___	Does the CMP contain the process to evaluate changes, including estimates and impact?
___	___	Does the CMP identify the person/group who can approve changes to the CMP?
___	___	Has the CMP been added under the configuration management baseline?

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Quality Assurance Network Management Required Documentation

Yes	No	Check List Description
___	___	Does a Network Baseline exist?
___	___	Does a Network Acceptance Plan exist?
___	___	Does a Network Operations Manual exist?
___	___	Does a Network Security Procedures Manual exist?
___	___	Does a Network Disaster Recovery Plan exist?
___	___	Does a Configuration Management Plan exist?
___	___	Help Desk Management Plan exist?

Quality Assurance Network Management

Network Operations

Yes	No	Check List Description
___	___	Are changes to the Network documented?
___	___	Are peer reviews implemented for network projects?
___	___	Are problem reporting and tracking procedures used?
___	___	Do network projects utilize project planning including a detailed work WBS?
___	___	Are original copies of software loaded on the network subsequently placed in a secure CM library?
___	___	Is disk space monitored and recorded on a regular basis?
___	___	Are backup procedures followed?
___	___	Is a secure destination for backup storage identified and used?

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Quality Assurance Network Management Equipment Moves

Yes	No	Check List Description
___	___	Has the physical layout of the room been planned?
___	___	Is there furniture available that will support the equipment?
___	___	Are LAN drops available?
___	___	Do the LAN drops work?
___	___	Are all necessary physical connections available?
___	___	Is there adequate power supply?
___	___	Is an UPS needed?
___	___	Have testing procedures been developed?
___	___	Has there been a peer review on the implementation plan?
___	___	Have the necessary requisitions been requested?
___	___	Has all necessary procurement been received?
___	___	Are tools necessary for assembly/disassembly available?

Quality Assurance Computer Support Help Desk

Yes	No	Check List Description
___	___	Does the help desk use problem reporting and tracking procedures?
___	___	Is there a problem escalation process?
___	___	Do the help desk technicians have a standard set of tools that may enable them to resolve a call on the first visit? Spacing problems again
___	___	Are security procedures for equipment followed?
___	___	Are there testing procedures in place to verify that changes to a user environment did not adversely affect other applications?
___	___	Are virus detection procedures used?

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EXHIBIT E

QUALITY ASSURANCE PROJECT PLAN (QAPP) TEMPLATE

U.S. Environmental Protection Agency
Great Lakes National Program Office
77 W. Jackson Boulevard
Chicago, Illinois 60604-3511

Instructions:

This QAPP template was prepared based on *EPA Requirements for Quality Assurance Project Plans* (EPA QA/R-5), EPA/240/B-01/003, March 2001 (http://www.epa.gov/quality/qs-docs/r5-final.pdf). It contains an outline of the QAPP elements based on the EPA QA/R-5, with an abridged description of the discussion that should be included within each section (included in redline text). This template was created as a tool to assist in development of QAPPs. Users of this QAPP template must consult the EPA QA/R-5 or the more general *Guidance for Quality Assurance Project Plans* (EPA QA/G-5), EPA/240/R-02/009, December 2002 (http://www.epa.gov/quality/qs-docs/g5-final.pdf) as appropriate to obtain additional details and guidance for development of a QAPP.

Acknowledgements:

This QAPP template was prepared by CSC, under EPA contract number EP-W-06-046, with the direction of Louis Blume, Quality Manager of EPA Great Lakes National Program Office and Work Assignment Manager.

DRAFT

QUALITY ASSURANCE PROJECT PLAN

Title of Project (or portion of project addressed by this QAPP)

Prepared for:

<Enter the contact information including affiliation and physical address>

Contract/WA/Grant No./Project Identifier <Enter specific identifier>

Prepared by:

<Enter the contact information including affiliation and physical address>

<Enter date>

SECTION A – PROJECT MANAGEMENT

A.1 Title of Plan and Approval

Quality Assurance Project Plan
<Enter Title of Project>

Prepared by:
<Enter Affiliation>

_____ Date: _____
<Enter name, Organization>, Project Manager / Principal Investigator

_____ Date: _____
<Enter name, Organization>, Quality Assurance Manager (or equivalent)

_____ Date: _____
<Enter additional contacts, as needed>

_____ Date: _____
<Enter additional contacts, as needed>

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<TOC must be regenerated upon completion of QAPP content>

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A.3 Distribution List

List the individuals and their organizations who need copies of the approved QA Project Plan and any subsequent revisions, including all persons responsible for implementation (e.g., project managers), the QA managers, and representatives of all groups involved.

<insert text>

Name, Agency/Company, Title, other contact information as needed

A.4 Project/Task Organization

Identify the individuals or organizations participating in the project and discuss their specific roles and responsibilities. Include the principal data users, the decision makers, the project QA manager, and all persons responsible for implementation. Project QA manager position must indicate independence from unit colleting/using data.

Table A.1 Roles & Responsibilities

Individual(s) Assigned	Responsible for:	Authorized to:
Name	• Responsibility • Responsibility •	• Action • Action •

Provide a concise organization chart showing the relationships and the lines of communication among all project participants. The organization chart must also identify any subcontractor relationships relevant to environmental data operations, including laboratories providing analytical services.

Figure A.1 Organization Chart

<insert org chart>

A.5 Problem Definition/Background

State the specific problem to be solved, decision to be made, or outcome to be achieved. Include sufficient background information to provide a historical, scientific, and regulatory perspective for this particular project.

- Clearly state problem to be resolved, decision to be made, or hypothesis to be tested
- Historical & background information
- Cite applicable technical, regulatory, or program-specific quality standards, criteria, or objectives

<insert text>

A.6 Project/Task Description

Provide a summary of all work to be performed, products to be produced, and the schedule for implementation. Provide maps or tables that show or state the geographic locations of field tasks. This discussion need not be lengthy or overly detailed, but should give an overall picture of how the project will resolve the problem or question described in A.5.

- List measurements to be made/data to obtain
- Note special personnel or equipment requirements
- Provide work schedule

<insert text>

A.7 Quality Objectives & Criteria

Discuss the quality objectives for the project and the performance criteria to achieve those objectives. EPA requires the use of a systematic planning process to define these quality objectives and performance criteria.

- State project objectives and limits, both qualitatively & quantitatively
- State & characterize measurement quality objectives as to applicable action levels or criteria

<insert text>

A.8 Special Training/Certification

Identify and describe any specialized training or certifications needed by personnel in order to successfully complete the project or task. Discuss how such training will be provided and how the necessary skills will be assured and documented.

<insert text>

A.9 Documents and Records

Describe the process and responsibilities for ensuring the appropriate project personnel have the most current approved version of the QA Project Plan, including version control, updates, distribution, and disposition.

Itemize the information and records which must be included in the data report package and specify the reporting format for hard copy and any electronic forms. Records can include raw data, data from other sources such as data bases or literature, field logs, sample preparation and analysis logs, instrument printouts, model input and output files, and results of calibration and QC checks.

Identify any other records and documents applicable to the project that will be produced, such as audit reports, interim progress reports, and final reports. Specify the level of detail of the field sampling, laboratory analysis, literature or data base data collection, or modeling documents or records needed to provide a complete description of any difficulties encountered.

Specify or reference all applicable requirements for the final disposition of records and documents, including location and length of retention period.

<insert text>

SECTION B – DATA GENERATION & AQCUISITION

B.1 Sampling Process Design (Experimental Design)

Describe the experimental data generation or data collection design for the project, including as appropriate:

- Types and number of samples required
- Sampling network design & rationale for design
- Sampling locations & frequency of sampling
- Sample matrices
- Classification of each measurement parameter as either critical or needed for information only
- Validation study information, for non-standard situations

<insert text>

B.2 Sampling Methods

Describe the sampling procedures:

- Identify sample collection procedures.
- Identify sampling methods and equipment
  - Sampling methods by number, date, and regulatory citation, where appropriate
  - Implementation requirements
  - Sample preservation requirements
  - Decontamination procedures
  - Any support facilities needed
- Describe specific performance requirements for the method.
  - Address what to do when a failure in the sampling or measurement system occurs
  - Who is responsible for corrective action
  - How the effectiveness of the corrective action will be determined and documented

<insert text>

B.3 Sampling Handling & Custody

Describe the requirements for sample handling and custody in the field, laboratory, and transport. Examples of sample labels, custody forms, and sample custody logs should be included.

<insert text>

B.4 Analytical Methods

Identify analytical methods to be followed (with all options) & required equipment.

- Specify any specific method performance criteria
- State requested lab turnaround time
- Provide validation information for non-standard methods
- Identify procedures to follow when failures occur
- Identify individuals responsible for corrective action and appropriate documentation

<insert text>

B.5 Quality Control

Identify QC activities needed for each sampling, analysis, or measurement technique. For each required QC activity, list the associated method or procedure, acceptance criteria, and corrective action. State or reference the required control limits for each QC activity and corrective action required when control limits are exceeded and how the effectiveness of the corrective action shall be determined and documented.

Describe or reference the procedures to be used to calculate applicable statistics (e.g., precision, bias, accuracy).

<insert text>

B.6 Instrument/Equipment Testing, Inspection, and Maintenance

Describe how inspections and acceptance testing of instruments, equipment, and their components affecting quality will be performed and documented to assure their intended use as specified.

Describe how deficiencies are to be resolved, when re-inspection will be performed, and how the effectiveness of the corrective action shall be determined and documented.

Identify the equipment and/or systems requiring periodic maintenance and/or calibration. Describe how periodic preventative maintenance will be performed, including frequency, to ensure availability and satisfactory performance of the systems. Note availability & location of spare parts.

<insert text>

B.7 Instrument/Equipment Calibration and Frequency

Identify all tools, gauges, instruments, and other sampling, measuring, and test equipment used for data generation or collection activities affecting quality that must be controlled and calibrated.

Describe or reference how calibration will be conducted using certified equipment and/or standards with known valid relationships to nationally recognized performance standards. If no such nationally recognized standards exist, document the basis for the calibration.

Indicate how records of calibration will be maintained and be traceable to the equipment.

<insert text>

B.8 Inspection/Acceptance of Supplies & Consumables

State acceptance criteria for supplies and consumables and describe how they will be inspected for use in the project. Note responsible individuals.

<insert text>

B.9 Data Acquisition Requirements for Non-Direct Measurements

Identify type of data needed from non-measurement sources (e.g., computer data bases and literature files), along with acceptance criteria for their use. Define intended use and describe any limitations of such data.

<insert text>

B.10 Data Management

Describe data management process from generation to final use or storage. Describe standard record keeping & data storage and retrieval requirements. Provide examples of any forms or checklists to be used.

Describe data handling equipment & procedures used to process, compile and analyze data (e.g., required computer hardware & software). Describe the process for assuring that applicable information resource management requirements, including EPA specific requirements, are satisfied.

<insert text>

SECTION C – ASSESSMENT AND OVERSIGHT

C.1 Assessments and Response Actions

Describe each assessment to be used in the project including the frequency and type (e.g., surveillance, management systems reviews, readiness reviews, technical systems audits, performance evaluations, data quality).

- What is expected information from assessment?
- What is assessment success criteria?
- What is assessment schedule?

Describe response actions to each assessment.

- How will corrective actions be addressed?
- Who is responsible for corrective actions?
- How will corrective actions be verified and documented?

<insert text>

C.2 Reports to Management

Identify frequency and distribution of reports to inform management of project status:

- Results of performance evaluations & audits
- Results of periodic data quality assessments
- Any significant QA problems

Identify the preparer and recipients of reports, and describe any actions the recipient should take as a result of the report.

<insert text>

SECTION D – DATA VALIDATION AND USABILITY

D.1 Data Review, Verification, and Validation

State criteria for accepting, rejecting, or qualifying data; include project-specific calculations or algorithms.

<insert text>

D.2 Verification and Validation Methods

Describe the process for data validation and verification. Identify issue resolution procedure and responsible individuals. Identify the method for conveying results to data users. Provide examples of any forms or checklists to be used.

<insert text>

D.3 Reconciliation with User Requirements

Describe how the project results will be reconciled with the requirements defined by the data user or decision maker. Outline the proposed methods to analyze the data and determine departures from assumptions established in the planning phase of data collection. Describe how reconciliation with user requirements will be documented, issues will be resolved, and how limitations on the use of the data will be reported to decision makers.

<insert text>

EXHIBIT F

Quality assurance at nuclear power plants: Basing programmes on performance

A look at how QA programmes are being improved

by
Frank Hawkins
and
Nestor Pieroni

A quality assurance programme is often incorrectly interpreted as only a regulatory demand and/or paperwork, with no effective impact in the overall performance of the nuclear project. Over the past decade, however, the nuclear industry has experienced a loss of public confidence stemming from real shortcomings in performance. This has led to dramatic changes in the perception of quality and how to achieve it.

In short, the nuclear industry as a whole has found that its traditional perception of quality assurance (QA) was not contributing to plant safety and reliability as meaningfully as it could and should do. The perception has significantly changed in recent years. *(See chart.)*

QA programmes may vary somewhat according to the cultural, historical, and industrial experience of the nations and organizations involved. It is generally agreed, however, that an effectively implemented QA programme governing all aspects of a nuclear power project is an essential management tool.*

Today, new challenges are demanding that QA programmes and their management be improved. This article looks at recent developments, and at the IAEA's role in assisting countries to achieve high levels of quality in the nuclear industry.

Implementing a QA programme

The image of someone inspecting or auditing work being performed by someone else often comes to mind when people hear the term quality assurance. Although partially correct, this image is not the complete picture. The person doing the inspecting or auditing probably belongs to a QA group or unit, but that unit is only performing one part of a properly conceived and effectively implemented QA programme whose final goal is overall quality of performance.

It is generally recognized that quality of performance is achieved in a more effective, timely, and productive manner when it is built into day-to-day operations rather than relying on inspection by another organizational unit after-the-fact. Therefore, it is desirable to have a line unit with an enhanced sense of responsibility for quality of performance. To complement it, effective assessment techniques must also be used to assist in the achievement of safety and other plant objectives.

Management is the key to assuring that the QA programme functions properly. Management's most important and challenging responsibility is to establish and cultivate principles that integrate quality requirements into daily work activities. It must be actively involved in the implementation of all aspects of the QA programme. Only in this way can management demonstrate the necessary commitment and leadership to achieve quality.

In practice, the QA programme works when those individuals in management, those performing the work, and those assessing the work all contribute to quality in a concerted and cost effective manner. QA is used by people throughout an organization, from the top executives to workers, including designers, scientists, welders, inspectors, foremen, operators, craftsmen, and auditors.

The above concepts underline the IAEA's present activities in QA.

* See *Good Practices for Improved Nuclear Power Plant Performance*, TEC-DOC 498, IAEA, Vienna (1989).

Mr Hawkins is a staff engineer in the US Department of Energy's Office of Nuclear Safety Policy and Standards, and Mr Pieroni is a staff member in the IAEA's Division of Nuclear Power.

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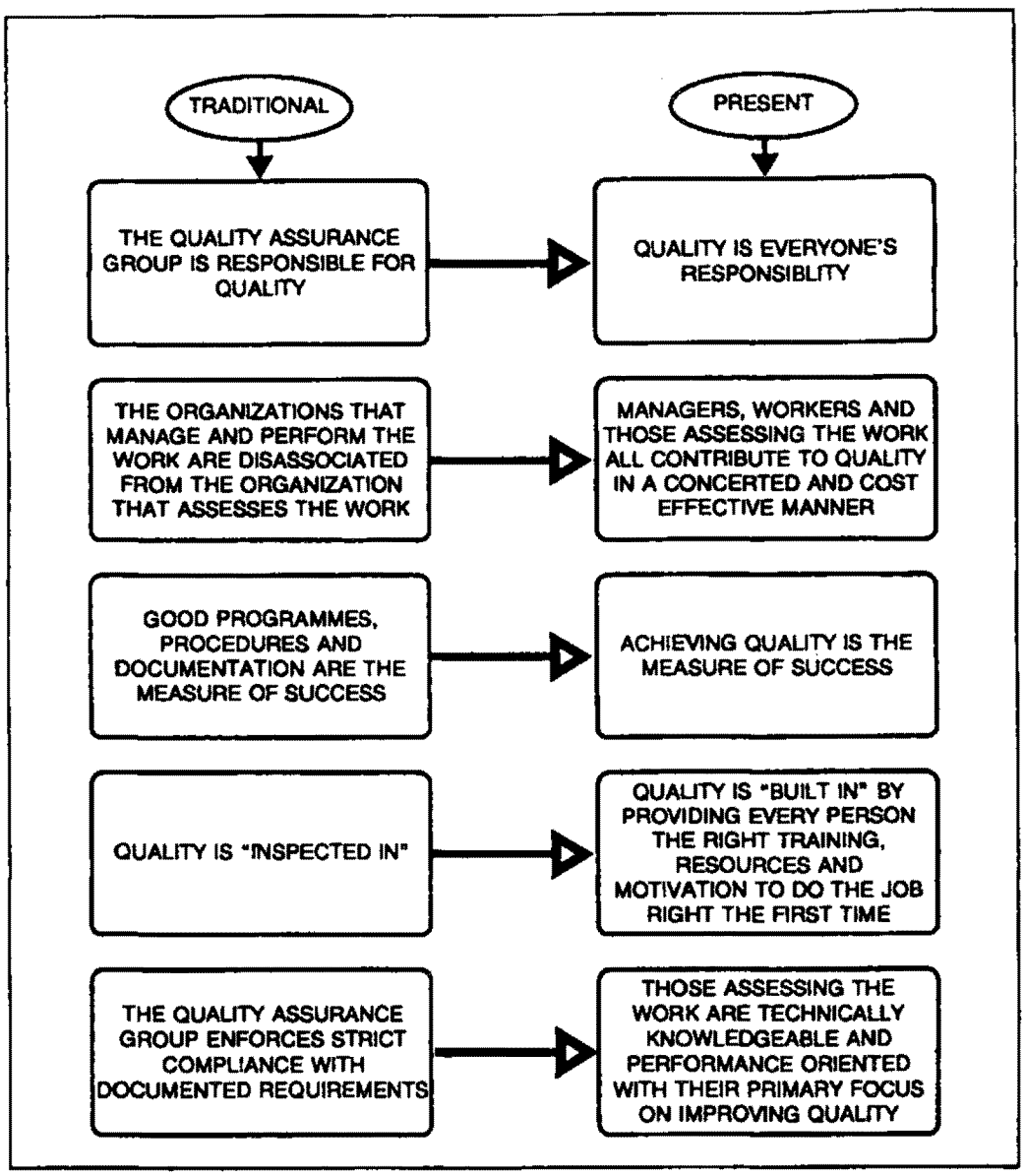

Quality assurance perception

Emphasis on performance objectives

Today's perception of QA focuses on quality of performance and encompasses all managerial, line, and assessment activities. The quality of performance concerns all areas in the nuclear project and therefore safety, reliability, and economics are positively influenced. The overriding principle is that safety shall not be compromised for reasons of production or economics, or for any other reason.

Every organization has performance objectives it strives to achieve. These performance objectives are achieved by way of implementing processes that are defined by the intermediate and subordinate objectives. When properly defined and controlled, these processes provide assurance that performance objectives will be met. The nature of the inherent interrelationship between performance objectives and the processes to achieve them defines an organization's level of success. When the balance between performance objectives and processes is skewed, when the focus on the latter increases while the performance objectives are ignored, this crucial relationship is destroyed. The ability of the organization to achieve its performance objectives — its reason for being — is lost. This has been a problem for the nuclear industry, resulting in the loss of momentum, money, and public confidence.

The nuclear community often tends to separate performance objectives from their processes. Many nuclear organizations become

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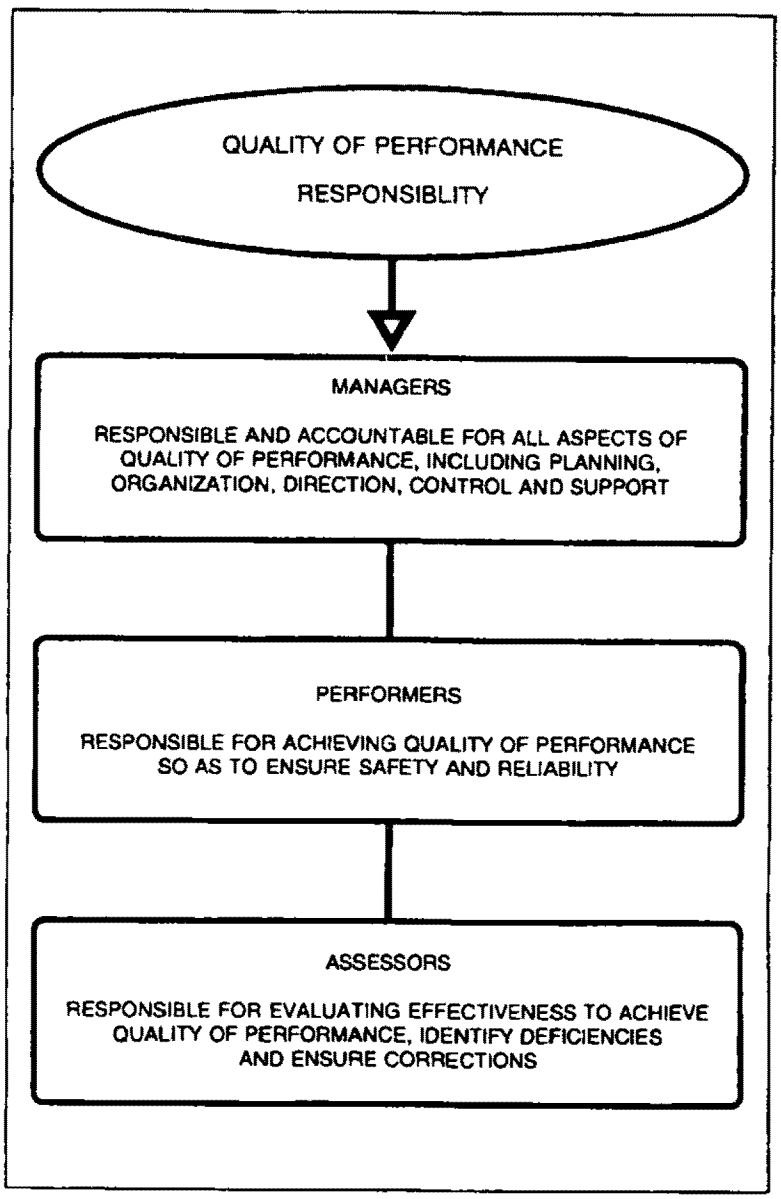
so absorbed in the "trees" of the processes (intermediate and subordinate objectives) that the "forest" of performance objectives is eclipsed from view. Traditional QA programmes sometime focus on the fine-grained details of activities, not stressing performance strongly enough. Hence, the credibility of the industry is called into question by a public that does not understand, and often fears, its objectives.

For example, a traditional QA programme for maintenance elevates the calibration of measuring and test equipment to the level of a performance objective rather than viewing it as one of a number of intermediate objectives. Although the content of a traditional QA programme and a performance-based programme are virtually the same, in the latter the subordinate objectives of calibration, control of items, performance of work under properly controlled conditions, and the use of instructions, procedures, and drawings is recognized as subordinate to the performance objectives.

As this example illustrates, a pragmatic and meaningful QA programme strikes the appropriate balance between performance objectives and processes. In other words, it focuses on performance objectives but does not abandon the processes needed to achieve them. A successful programme is performance-based at the highest level. This biases the programme toward achieving the organization's performance objectives, which should be carefully defined and limited in number.



Performance-based quality assurance

IAEA developments in QA

Over the past years, the international community has recognized shortcomings in the conception and implementation of nuclear QA programmes. The IAEA is making use of the extensive experience and information resources of its Member States to put in place the beginnings of a new and meaningful QA culture to contribute to improved nuclear power plant safety, reliability, and performance.

In 1990 the IAEA began a planned and systematic programme to enhance nuclear safety by revising and improving its QA code and the accompanying safety guides. Through this revision the QA documents are being updated to depict contemporary principles and techniques for managing, achieving, and assessing quality.

In revising the codes and guides, the IAEA's objective is to instill a new culture in which there is a commitment to achieving a rising standard of excellence. This new culture demands that the performance objectives and the methods employed to achieve them be continuously improved. In the broadest sense, quality is the degree of excellence that an item or service possesses based on the user's needs. It is achieved by consistently meeting the defined requirements. It follows, then, that QA constitutes all those actions that provide confidence that quality is achieved.

The nuclear industry worldwide is reaching beyond traditional QA methods and taking a broader perception of quality where individuals in management, people performing the work, and people assessing the work all contribute to quality in a concerted and cost-effective manner. Recognizing this, the IAEA's main goal is to recommend ways to ensure that nuclear risks are minimized while safety, reliability, and perfor-

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mance are maximized through the use of an effective QA programme.

The new QA culture endorsed by the Agency recognizes that it is management's role to establish and cultivate principles that integrate quality requirements into daily work. For this integration to be successful, the individual performing the work has to be provided with the proper information, tools, support, and encouragement to properly carry out assigned tasks. It is incumbent on management to define requirements; properly train, motivate, and empower personnel; provide appropriate resources; and assess performance. Management is expected to demonstrate commitment and leadership through active involvement in the implementation of an effective QA programme. The role of individual employees is to meet established requirements while recommending improvements in item and process quality.

This new QA culture is not an indictment of Member States' existing programmes. On the contrary, the IAEA recognizes Member States' extensive work in the QA discipline and complements them on their accomplishments in this regard. It is the Agency's intent that users of the revised code and safety guides examine their existing programmes to identify areas where enhancements can be made by building in the contemporary quality principles and techniques discussed here. These place greater emphasis on being "right the first time" rather than finding and correcting mistakes later.

Revised IAEA codes and safety guides

The IAEA's documents on quality assurance, issued through the Nuclear Safety Standards (NUSS) programme, are generally recognized and applied in establishing nuclear safety regulations in the majority of countries with operating or planned nuclear power programmes. Approximately 30 Member States have officially adopted or unofficially used the IAEA code and safety guides on QA as their national requirements. In these countries the IAEA documents strongly affect the relationship among regulators, nuclear owners, and their suppliers.

IAEA safety standards on QA (the code plus 10 safety guides) were developed during a period of about 10 years between 1974 and 1984. One safety guide was revised in 1986 and the code was revised in 1988. An integral revision and completion of the IAEA standards to reflect present practices was initiated in 1990 This task is envisaged as the first step in establishing a procedure of periodical revision to maintain the updating of the documents. The intention is to review the standards for their effectiveness and usefulness in the face of changing technology and acquired experience. Without such review, standards would have low practical value, since adherence to them would result in items or services of lower technical value than could and should be achieved. The envisaged review policy attempts to eliminate rigidity of standards, minimize procedures, and provide flexibility to accommodate changes in technology, attitudes, developments, and experiences in all parts of the world. Such flexibility is intended to be built into the standards through planned periodical revisions or replacements of standards every few years.

The second revision of the QA code now being done provides the basic requirements and principles for establishing and implementing QA programmes for the siting, design, construction, commissioning, operation, and decommissioning of nuclear power plants. The code's requirements reflect the modern concept that all work is a process that can be planned, performed, assessed, and improved. The code provides basic QA requirements which comprise the foundation of a comprehensive QA programme. The requirements are broken down into three functional categories: management, performance, and assessment. These categories capture the range of activities common to all work, from organizing and staffing to assessing results and providing feedback to improve the process.

The application of these basic QA requirements extends to all those individuals and entities that are responsible for the nuclear power plant, including plant designers, suppliers, architect-engineers, plant constructors, manufacturers, and plant operators. The requirements reflect a comprehensive way of doing business throughout the life cycle of a nuclear power plant.

The revisions of the IAEA's safety guides on QA establish a new planned and integrated framework to complement the revised code. The guides provide recommendations to fulfill the basic requirements contained in the code. As such, they play an important role in providing Member States with more prescriptive guidance regarding the code's implementation. The details of the safety guides, while not the only way to meet the requirements of the code, represent implementation methods that are generally accepted and proven by experience.

The code and safety guides are intended for use, as appropriate, by licensees, regulatory bodies, and other pertinent organizations. The requirements embodied in them apply to all aspects of work at or in support of the safety of a nuclear power plant, and they can be usefully applied to nuclear facilities other than nuclear power plants.

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In pursuing the revision of the QA standards, the IAEA collects the advice on successful practices to be reflected in the documents which are adopted by many countries. In the revision process the documents are critically reviewed and assessed through advisory group meetings which include representatives from nuclear utilities, regulatory bodies, and vendors. In this way all the partners commonly involved in a nuclear power project participate in the development of the standards and ensure that the final result is acceptable and applicable to everyone. Representatives from international organizations such as the Commission of the European Communities (CEC), the European Atomic Forum (FORATOM), and the International Organization for Standardization (ISO) also take part in the revision process. The opportunity is also taken to align the standards more closely with other international quality standards, such as those from ISO, where this is feasible.

Conclusion

Experience has shown that the inherent limitations of the traditional perception of QA have, in part, resulted in mediocre plant performance and instances of compromised plant safety and reliability. Conversely, satisfactory performance is being achieved by IAEA Member States which have already begun implementing the principles discussed here. Their successes attest to the wisdom of implementing a more performance-based approach to QA that emphasizes programme implementation and effectiveness, rather than programme development and documentation as the traditional perception does.

Nuclear power is a well-established part of many countries' energy programmes. While the nuclear industry has generally maintained a good safety record, improvements can always be made. It is with this hope of further improving nuclear safety that revision of the IAEA code and safety guides on QA is being offered to Member States. The Agency is confident that the nuclear option will continue to be exercised as a reliable and clean source of energy if nuclear safety, both real and perceived, can be ensured.

Revitalizing QA through the application of the improved approach will require the constant willingness to re-examine and re-evaluate the status quo. This in turn requires a willingness to accept and implement change, and it is through change that improvements are realized. It is natural human tendency to resist change, but maintaining the status quo is a sure formula for perpetuating the problems of the past and for not realizing future opportunities. It is for the sake of improving safety, reliability, and economics that the challenge to move towards performance-based QA programmes is encouraged.

Water tests by chemistry technicians at nuclear plants help prevent corrosion of components. (Credit INPO)

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