COMMONWEALTH EDISON COMPANY

LASALLE COUNTY STATION

CHICAGO, ILLINOIS

TECHNICAL PROPOSAL

PROJECT 6356-N

C F BRAUN & CO

ALHAMBRA, CALIFORNIA

AUGUST 25, 1982

CONTENTS

Attachment 3

SCOPE OF WORK

The scope of work for this project is to perform an independent review of the safety-related, and seismic supported non-safety related HVAC systems at the Commonwealth Edison Company (CECO) LaSalle Nuclear Plant.

The review will include all seven LaSalle unit one safety-related HVAC systems listed below.

- Control Room HVAC System (System Identification Code VC)
- Auxiliary Electric Equipment Room HVAC System (VE)
- Diesel-Generator Room Ventilation System (VD)
- CSCS Equipment Area Cooling System (VY)
- Switch Gear Rooms Ventilation Systems (VX), except for the recirculation duct in the Auxiliary Building HVAC Equipment Room.
- Portions of the Reactor Building Ventilation System (VR) - The following parts of the reactor building ventilation system are safety-related.
  - Supply air duct between and including the secondary containment isolation dampers and the duct penetration of the secondary containment boundary.
  - Exhuast air duct between and including secondary containment isolation dampers, and the duct penetration of the secondary containment boundary.
  - Exhaust air duct between and including secondary containment isolation dampers, and the duct penetration of the secondary containment boundary.
- Those portions of the Standby Gas Treatment System SGTS (VG) installed by the Zack Co.

The review will also include the supports for all three non-safety related but seismically supported systems listed below:

- Primary Containment Ventilation System (VP)
- Primary Containment Purge System (VQ)
- Reactor Building Ventilating System (VR)

Attachment 3

SCOPE OF WORK Continued

The primary objective of this independent review is to provide verification that the HVAC installation by the Zack Co is in accordance with the Sargent and Lundy design. The scope of work will include, but not be limited to, a review of -

Material installed

Field and shop welding on supports and ductwork

Operability of associated mechanical equipment

Significant design changes

Field testing by Zack Co up to, and including, any construction testing performed by Zack Co or their subcontractors.

During this review Braun will be responsible for identifying any additional testing or changes necessary to assure that the HVAC systems fulfill their safety function. Braun will also review the adequacy and results of additional tests as performed by others.

All observations made during the review shall be documented and submitted to a Braun site review team composed of senior technical personnel with broad experience in technical management. This review team will determine if the observation is accurate and has the potential for a safety concern. If the team determines that the observation is accurate, but is not a safety concern, it shall be submitted to CECO for disposition.

If the observation is considered a potential safety concern, it shall be submitted to a second level internal review committee. The internal review committee, located in the home office, will review the finding expeditiously and if the finding is not a safety concern, they shall indicate in writing why not and return the finding for appropriate disposition. If it is determined to be a safety concern, they shall indicate in writing why and return the finding to the Braun project manager. He will notify CECO of this safety related finding.

A final report documenting this review shall be sent to CECO which will, in turn, concurrently distribute the reports, unedited, to the NRC staff, S&L, and internally within CECO. Prior review or editorial control of the written report by any of these parties will not be made.

Attachment 3

SCOPE OF WORK Continued

All inspection, review activities, quality assurance, project procedures, to be performed by C F Braun & Co during this independent review of the HVAC systems will be conducted in accordance with written, approved procedures. These procedures will contain all the necessary forms to document the Braun activities with regard to this review. Those procedures will include but not necessarily be limited to the following Braun activities:

a) Document Control

b) Quality Control Inspection

c) Interface between the Braun Site and the Braun Office Internal Review Committee

d) Quality Control Inspection

e) Training and Qualification of Inspectors to the Requirements of ANSI-N 45.2.6 - 1978 (Regulatory Guide 1.58)

f) Quality Assurance Audits

g) Qualification of Quality Assurance Program Audit Personnel to the Requirements of ANSI-N 45.2.23 - 1978

h) Processing of Observations/Findings Report

During the review it is understood that CECO will make available all documents requested by Braun that are needed to perform this review.

As part of this work Braun will provide for CECO approval the Braun Quality Assurance Manual and QA Topical Report, and Braun's Security Screening Procedure. We will also have all personnel involved in this review execute the required CECO forms that show freedom of substantial interest in CECO or Zack Co.

It is our intent to provide adequate support of this review effort so that the report of our findings will be submitted by Braun to CECO and the NRC simultaneously. The target date for this submittal is September 15, 1982 or subsequent date as directed by CECO.

Attachment 3

WORK PLAN

This section of the proposal describes the work plan for Braun's independent review of the HVAC installation of the Zack Co at CECO LaSalle Nuclear plant. Braun sent a team of knowledgeable individuals (Vice President of Power, Manager of Nuclear Projects, and Review Team Project Manager) to Chicago in order to describe the Braun organization, present their experience and qualifications and highlight their availability. This was accomplished for the benefit of CECO and S&L as well as in a separate meeting with the NRC Region III office.

In order to accomplish the review task, Braun will form a project team at the LaSalle site consisting of project manager, HVAC technical advisor, QA engineer, welding/material engineer, QC supervisor, and other personnel to work under the supervision of these individuals. Certain key people will be sent to LaSalle in order to develop QA instructions, detail work procedures and other activities which are required prior to commencement of productive work.

The HVAC technical advisor will compare the S&L design documents to the Zack Co shop drawings to verify that Zack has correctly interpreted the design documents. Zack's procedures for procurement and processing of HVAC material will be reviewed by the QA and welding/material engineers to evaluate their conformance to appropriate S&L design documents and ANSI standards.

The welding/material engineer will also review the weld procedure qualifications and welder qualifications associated with the ductwork fabrication practices. Any information or testing generated by CECO or Conam will be used to assist in this evaluation. Zack's fabrication procedures will be compared to SMACNA standards and ANSI 509 requirements, as appropriate, in addition to that required by the design documents.

The HVAC technical advisor will survey all of the installed duct systems as defined on page 1-1 of the SCOPE OF WORK. Based on this survey he will select portions of the system whose failure may jeopardize the operation of safety-related equipment for detailed inspection. The portions selected will include concealed and insulated ductwork. If discrepancies are found in the selected portions, then additional portions of ductwork will be selected for further inspection. Braun is prepared to inspect 100 percent of the system if deemed necessary.

The leak rate and balancing test for the Control Room HVAC System (VC), CSCS Equipment Area Cooling System (VY) and portions of the Reactor Building Ventilation System (VR) will be reviewed in detail to verify system conformance to the design documents. Spot checks will be made of the Auxiliary Electric Equipment Room HVAC System (VE), Diesel Generator Room Ventilation System (VD) and Switch Gear Rooms Ventilation Systems (VX) to ascertain that they have been tested to the same quality as that of the systems reviewed in detail. In addition, the HVAC technical advisor will survey the system operating tests performed by CECO to verify that the results confirm the adequacy of the balancing/leak rate tests.

WORK PLAN Continued

A review of the HVAC refrigerant system, subcontracted by Zack, will also be accomplished. Preliminary information indicates that there have been no nonconformances generated against these systems.

In addition to this step-by-step review of the Zack installation, Braun will review all CECO and Zack NCRs and FCRs generated against the installed system. Each document will be categorized by type for example, weld problem; material certification lacking; location/ dimensional/interference discrepancy; fabrication problem; etc. The frequency of occurrence and importance of each category will be assessed. Twenty percent of those types determined to be critical to safety will be inspected in detail to verify that the specified disposition has been correctly implemented. If discrepancies are found, then the remaining NCRs of this type will be reviewed.

The HVAC technical advisor will randomly select other parts of the system to be inspected for similar types of nonconformances. The inspections will result in a determination of whether or not similar types of nonconformances may have existed on these random sections but were not reported.

Project instructions and quality assurance procedures will be written to provide direction and guidance in accomplishing the work plan. Appropriate forms will be provided to document the observations and findings made during the course of the work.

All available inspection reports will be reviewed to determine if the inspector's observations may lead to a potential finding. Such reports will be evaluated by a site review committee consisting of project manager, QA engineer, and HVAC technical advisor or material/ welding engineer, depending on the expertise required. The site review committee will determine if the observation is accurate and has the potential for a safety concern.

If the site review determines that the observation is accurate, but is not a safety concern, it will be properly documented and submitted to CECO for appropriate disposition. Dispositioning may involve field correction, additional analysis, or both.

If the finding is considered a potential safety concern, it will be forwarded to an internal review committee within Braun for their concurrence. This committee will be chaired by Braun's chief nuclear engineer and will include senior technical personnel in the appropriate field of expertise for the finding being evaluated. If this committee determines that the finding is a safety concern, the project manager will immediately notify CECO. CECO will properly document and disposition such finding (including taking proper action in accordance with the technical specifications), and notify the NRC.

Attachment 3

PROJECT ORGANIZATION

This section of the proposal describes the organization and people Braun will use for this project. First, we describe our Project Organization, including an organization chart. Then, we enclose resumes for the candidates for all positions on the chart.

We plan to use a task force approach, with home office personnel being assigned to the project and located at the LaSalle County Station. The internal review committee will be located in Alhambra. Other specialists may be added to the task force as required.

An organization chart for the project follows. Responsibilities for the positions shown on the chart are defined below.

PROJECT MANAGER The Project Manager has the prime responsibility for execution of the project. He is responsible to CECO and to Braun management for the overall success of the project. His principal areas of concern are the planning, scheduling, and performance of the work. He issues the project instructions, procedures and schedules for the execution of the work, and keeps them current. He is your principal contact on these matters, and reports on all elements of progress to you. The project manager has the organizational freedom to call on all resources of the company to support the project in areas required. He reports to the Manager of Nuclear Projects of the Power Division.

QUALITY ASSURANCE ENGINEFR The Project Quality Assurance Engineer is responsible for all project QA activities. Those activities include the writing of all quality assurance procedures necessary to perform an independent review of the ten designated HVAC systems at CECO's LaSalle Nuclear Station. The PQAE will obtain the necessary approvals for these procedures. He will establish a document control system and provide for the collection, maintenance and storage of all QA records generated during this Independent Review, in accordance with the Requirements of ANSI-N 45.2.9. The PQAE will review and sign-off on all observation/finding reports prior to their being sent to the Management Review Committee in Alhambra. He will assure himself that all personnel participating in this review are qualified to perform the task to which they have been assigned. He will assure that these qualifications are properly documented in accordance with ANSI-N 45.2.6 and ANSI-N 45.2.23. The PQAE will then provide for the monitoring, surveillance and auditing of all activities, both Project and Inspection. All audits will be performed to pre-planned check list and will be distributed to both Braun's Management and Commonwealth Edison Management simultaneously. All audits will be performed in accordance with the C F Braun & Co's Nuclear Quality Assurance Manual and will be documented on the forms contained therein.

PROJECT ORGANIZATION Continued

QUALITY CONTROL SUPERVISOR The Quality Control Supervisor will interface with the HVAC Engineer on matters relating to the inspection of the HVAC hangers and ducting.

All requests for duct and hanger inspection made by the HVAC Engineer will be presented to the QC Supervisor who will assign the work to an inspector. The QC Supervisor will make contact with site construction personnel making arrangements for scaffolding around the work area, removal of paint, insulation or other materials that may interfere with the inspection. Additional items such as drawings, FCRs, NCRs, or surface inspection materials will also be supplied by the QC Supervisor when required to assist in the inspection.

The inspection reports will be returned to the QC Supervisor for his review. He will complete additional forms if reportable findings are determined during inspection and distribute these forms to the HVAC Engineer and Project Manager for review.

The QC Supervisor will assist in duct and hanger inspection when required and work with the Braun Material/Welding Engineer to resolve questions regarding weld quality and material identification.

HVAC TECHNICAL ADVISOR The HVAC Technical Advisor will determine which HVAC system or part of an HVAC system will be inspected. He will work with the QC Supervisor to assign the Quality Control inspection assignments for the HVAC ductwork and ductwork supports.

The NCR and FCR will be reviewed to determine if the ductwork, as called out in the NCR or FCR should be inspected.

The HVAC Technical Advisor is responsible for verifying that the HVAC systems have been installed in accordance with the design drawings and that the systems fulfill their safety functions. He provides guidance to the QC Supervisor and materials/welding advisor as to the extent and nature of their reviews. The advisor will survey the installed HVAC systems and select those portions requiring detail inspections.

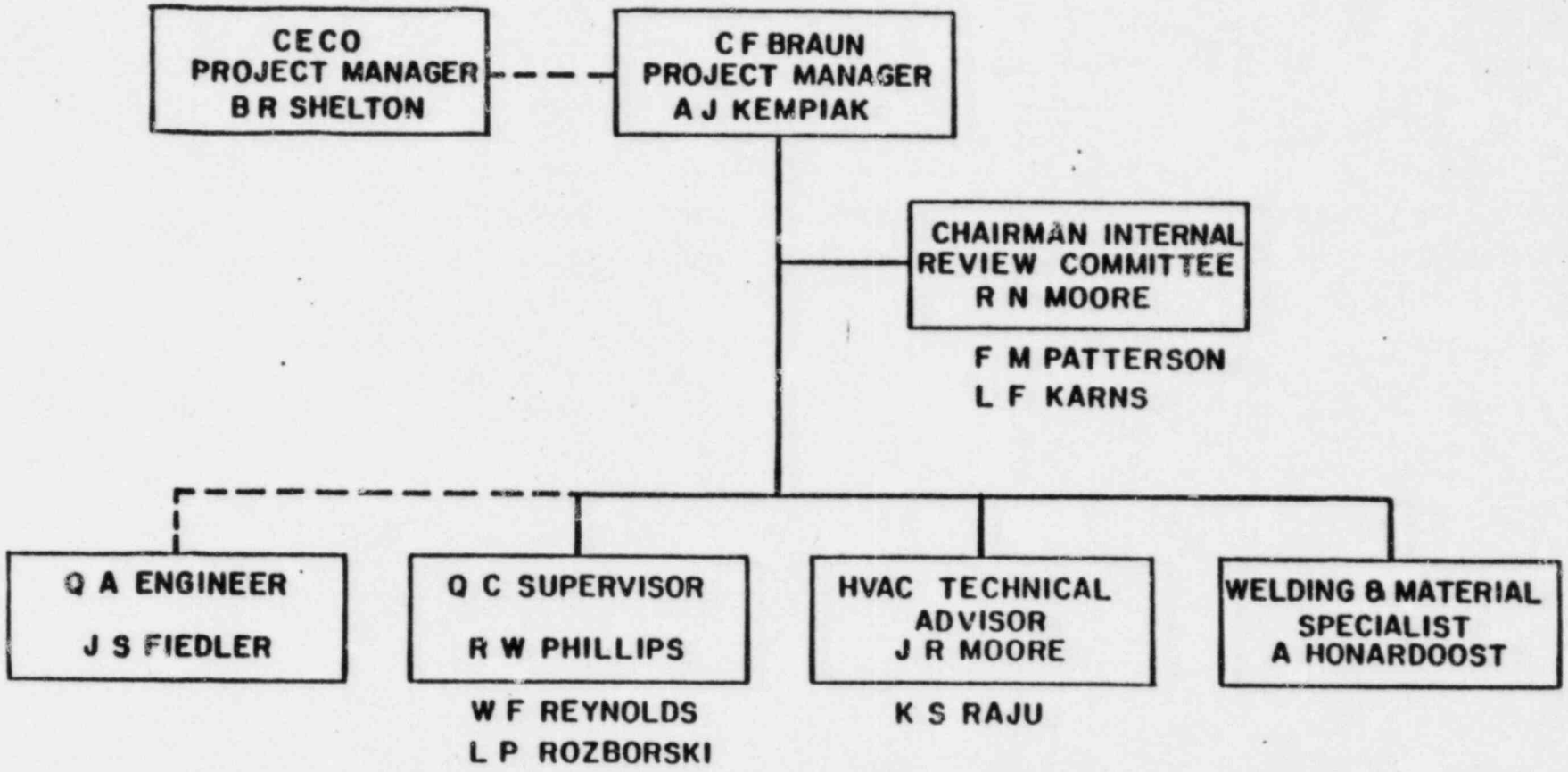
He is also responsible for reviewing the applicable tests performed by the HVAC contractor plus a survey of the associated HVAC preoperational tests performed by CECO. Another area of his review will be the installation of the refrigerant system. He will also assist in a review of any applicable nonconformances and field change requests as well as participating in the site review committee in his area of expertise.

PROJECT ORGANIZATION Continued Attachment 3

WELDING AND MATERIAL SPECIALIST The Welding and Material Specialist is responsible for the review of all welding procedures which were used by the contractor. He will review all welder qualifications of the contractors' personnel who performed that welding. He will assist in the evaluation and determination of the integrity of the welding which has been completed by the contractor. Should any material sampling (chemicals) or weld tensiles be required he would assist in the sampling and test evaluations as necessary.

This Welding and Material Specialist will be utilized extensively as a consultant whenever any problem involving Metallurgy arises. Additionally, he will be utilized in the review of nonconformances and field change requests involving welding of duct hanger support and duct joints.

PROJECT ORGANIZATION



COMMONWEALTH EDISON COMPANY,
PROJECT 6356-N, AUGUST 25, 1982

C F BRAUN & CO

Attachment 3

RESUMES Attachment 3

KEY PERSONNEL

The following are the key personnel we propose for this project. Their resumes are included on succeeding pages.

Attachment 3

PROJECT ENGINEER

A J KEMPIAK Andy Kempiak has over 17 years experience in power and related fields, including the past 15 with Braun. His primary areas of expertise include mechanical systems and HVAC engineering.

His current assignment is as Engineering Manager for the 1220 MWe TVA power plant project. Here he directs four project engineers responsible for building design coordination, customer interface, supplier review, and coordination with field forces. Prior to this, he served as Project Engineer for field coordination activities, involving monthly meetings with owner and field engineering staff.

Andy was leader of a group of up to 15 engineers and designers responsible for mechanical system and the HVAC design and layout activities on the TVA project. Systems designed included waste processing, service, cooling, and heated water, and chilled water systems. He was responsible for the design of all chilled water systems on the TVA project, and wrote procurement specifications for major chiller packages. Other systems he designed and specified equipment for include gas filtration and fire protection.

Within Braun's building mechanical group, he was responsible for various types of HVAC and utilities systems. As group leader on the Lawrence Livermore project, he prepared P&I flow diagrams, design and procurement specifications, HVAC and piping drawings, and preoperational test specifications for all utility systems. He was also responsible for HVAC system design and checkout on several Rocky Flats Weapons Facility projects. He designed complex ductwork systems, sized fans and other equipment, and worked as a field engineer on a plant expansion program.

On the USAF Satellite Test Center and Power Plant project, he was responsible for all HVAC design. This included the design of supply and exhaust air systems for gas turbine units and heat recovery boilers, and the design of the air-conditioning system for the plant, including chillers, HVAC units, and associated equipment.

Mr Kempiak has a BSME degree from the University of Illinois, and is a registered professional mechanical engineer in California.

Attachment 3

QUALITY ASSURANCE ENGINEER

J S FIEDLER Jim has over 30 years experience in nuclear engineering and construction, the past 12 years as the Project Quality Assurance Engineer on various nuclear power plants throughout the United States. They include the Duane Arnold facility at Palo, Iowa, a 550 MW BWR unit for Iowa Electric Light and Power Company, the Greenwood Energy Center consisting of one fossil plant (800 MW) and a four-unit nuclear plant, PWR units (1250 MW each) for the Detroit Edison Company, the St Lucie nuclear unit 1, an 8 0 MW PWR for Florida Power and Light, the Waterford III nuclear unit, a 900 MW PWR for Louisiana Power and Light.

Since joining Braun in 1977 he has been assigned as the Project Quality Assurance Engineer on the Baily nuclear project, a 600 MW BWR unit for Northern Indiana Public Service Company and is currently assigned as the Project Quality Assurance Engineer on the GE/TVA STRIDE projects.

Prior to specializing in quality assurance, Jim was a design and operations engineer at the University of California's Lawrence Radiation Laboratories at Berkeley, California and was the site representative for the Universities' Research Association during construction of the Fermi-National Accelerator Laboratory at Batavia, Illinois.

Before his university association he spent eight years as a design engineer with Westinghouse Electric Company, Bettis Facility in Pittsburgh, Pennsylvania, during the early development of the US Navy nuclear program.

Mr Fiedler has a BA from Waynesburg College, and a BSME from the University of West Virginia. He is a registered professional engineer in Pennsylvania.

QUALITY CONTROL SUPERVISOR

Attachment 3

R W PHILLIPS Bob has 28 years experience in Source Quality Control, eight years with Braun. His latest assignments with Braun include Source Inspection Coordinator on four projects. He was in charge of implementing the Positive Material Identification Program, currently in use. This included the operation of the analysis equipment required in the PMI program.

Bob's other duties have involved conducting training and certification of personnel in liquid penetrant, magnetic particle, radiographic and ultrasonic examination as a certified NDE Level III Examiner. Also inspection of pressure vessels, heat exchangers, piping, furnace equipment, pumps, storage tanks and structurals.

Prior to working at Braun, while at Richardson X-Ray Company, Bob directed operation of a commercial nondestructive inspection laboratory. While at Boeing, Bob performed plant surveys and supplier audits in NDE and electrodeposited plating facilities. He conducted inspection on components for aerospace use. At Richardson X-Ray Company, he was the quality control manager for a nondestructive inspection facility. At Ferro-Spec Laboratories, he managed a commercial nondestructive inspection laboratory. And, at Aerojet General he also performed source inspection and wrote manufacturing procedures in quality engineering.

Mr Phillips attended Mt San Antonio College. He is a member of the American Society of Nondestructive Testing.

Attachment 3

MECHANICAL ENGINEER

J R MOORE Jack has 31 years experience in the mechanical engineering field, the past 14 at Braun. He is presently a principal engineer in the Mechanical Engineering Department. His primary areas of expertise are in HVAC, fire protection, and plumbing and piping systems.

He is presently the leader of the HVAC group on the TVA STRIDE project. In this role he is responsible for all group functions, including heating and cooling calculations, design and specification of equipment, ductwork arrangement and sizing, and determination of environmental conditions in normal operation and accident conditions.

His other nuclear projects include field and home office assignments on the Rocky Flats Part V Expansion and Plutonium Recovery projects. Here he designed sophisticated three-zone HVAC systems for use in areas where protection of operating personnel from very hazardous plutonium substances was vital. He also was active in the fire protection area on these projects. Finally, he prepared design criteria, specifications, and estimates for the General Electric LMFBR project.

Jack's other assignments at Braun have included US Air Force facilities, a tetraethyl lead plant, an x-ray telescope, and a foam latex plant.

Prior to joining Braun, he was with Ralph M Parsons, where he worked primarily on Minuteman missile projects in the environmental and HVAC areas. With J H Pomeroy and Co, he designed air conditioning systems, plumbing, process piping, and fire protection, for a Polaris missile manufacturing facility and Vandenburg AFB. His other experience includes industrial drying systems and liquid carbon dioxide fire protection systems.

Mr Moore holds a BSME degree from Chicago Technical College.

Attachment 3

METALLURGICAL ENGINEER

A HONARDOOST Abbas Honardoost has over 15 years experience, primarily in the power field. He selects critical metallic and nonmetallic materials used for equipment in Braun-engineered process plants. Reviews job specifications for agreement of all materials selection and fabrication with Braun standards, customer standards, and the various applicable codes. Provides materials and welding consultation on various assigned projects. Provides technical assistance on metallurgical matters to Sales, Engineering, Power, Construction, and others. Performs complex metallurgical research assignments on projects relating to fabrication, mechanical properties, or corrosion of metals and alloys. He has been with Braun for one year.

Prior to joining Braun, Abbas served as a Senior Quality Engineer with Gilbert Commonwealth. Here his primary duties involved preparation of welding and non-destructive testing procedures for both in-house and subcontractor applications on a number of power projects. In this role he worked with various members of the project team on problem areas which arose in equipment fabrication shops, field construction, and during plant operation. Included in his assignments was an audit of welding procedures in the HVAC and piping systems in a nuclear power plant.

Abbas also worked with Burns & Roe as a Senior Metallurgical Engineer. Here he worked closely with subcontractors on welding and heat treatment procedures in compliance with ASME, ASTM, ANSI, AWS, and NRC requirements. He was a site engineer on the WPPSS No 2 project, resolving problems in corrosion, failure analysis, and welding of piping and HVAC systems. This assignment included review of field procedures and performand qualification of welders.

As a Corrosion Engineer at Ebasco Services, he was responsible for all phases of corrosion prevention on nuclear and fossil power plants, refineries, and chemical and petrochemical facilities. This work included the development of laboratory testing programs for protective coatings, and the design and supervision of cathodic protection systems.

Prior to joining Ebasco Services, Abbas was corrosion and inspection engineer with the National Iranian Oil Company and a materials engineer with W R Grace.

Mr Honardoost received his BSChE from the University of Delaware, and his MS in Metallurgy from the Stevens Institute of Technology. He has been accredited as a corrosion specialist by the NACE, and is an AWS Certified Welding Inspector.

Attachment 3

QA/QC COORDINATOR

W F REYNOLDS Bill has over 30 years experience in management planning, estimating, design, procurement writing, procedure and specification, quality assurance, quality control field erection, and startup of new and expansion facilities embracing all fields of chemical plants, nuclear generating stations, conventional generating stations, and allied industrial complexes.

Quality Assurance Manager of a multi-billion dollar Saudi Arabian Project including development of the "Pioneer" Camp, establishing jobsite perimeters, initial development of a quality program for the management services contractor, and establishment of bid analysis procedures in accordance with acceptable Saudi Arabian government criteria.

Corporate Quality Assurance Audit Team Leader for various Middle East projects. Development of audit checklists, preparation/notification to all responsible parties of audit dates and subjects, pre and post audit conferences culminating with the issuance of formal audit reports.

Field Quality Control Supervisor for one of the largest management services contracts including interviewing, staffing and supervision of quality control (QC) engineers, laboratory technicians, Saudi national engineering students and QC inspectors. Published a Field Quality Control Manual for the industrial complex, assigned QC personnel to various phases of construction, testing, contracts, procurement, and implementation of all disciplines within the "Kingdom" of Saudi Arabia.

Instrumentation Superintendent during construction/start-up of a 1.7 MGPD diesel unit including field design of sensing and loading lines along with providing written and verbal instructions to international instrument crews. The jobsite was the Saudi Naval Base in Jeddah, Saudi Arabia, and the assignment included start-up of package boilers, checking out system controls by use of the logic diagrams, and actual pressure testing of the tubing/multitube "bundles".

Start-up Engineer for two 960 MW nuclear power plants (BWR Mark III), including development of safeguard systems, punchlists, and progress reports.

Mr Reynolds is 56 years old, and holds a PE degree from Marietta College. He is also certified to ANSI 45.2.6.

Attachment 3

SOURCE QUALITY CONTROL INSPECTOR

L P ROZBORSKI Larry has 33 years engineering and shop experience, 7 years of source inspection with Braun. He has been assigned to inspection of compressors, turbines, pressure vessels, towers, heat exchangers, storage tanks, furnace equipment, and other petrochem process equipment.

Larry's other duties have involved design engineering, shop layout and supervision. He is certified as a Level 2, to SNT-TC-1A in radiography, magnetic particle liquid penetrant and ultrasonic examinations. He is familiar with API, ASME, and TEMA Codes. He is certified senior engineering technician by the Institute for the Certification of Engineering Technicians.

Prior to working at Braun, while at Bos-Hatten, Inc, Larry was responsible for all inspection procedures and QC for ASME shop certification. He wrote welding procedures and maintained qualifications of welders to ASME standards. He held positions of shop superintendent and manager of engineering.

Larry also worked for American Standard as metallurgical lab technician, senior draftsman where he was responsible for all radiography, nondestructive examinations and welder qualifications. And, for Worthington Corporation as a design draftsman.

Mr Rozborski attended Erie Community College, evening extension courses and various seminars conducted by technical societies. He is a registered Professional Engineer in Quality Engineering in California. He is a member of the American Society of Mechanical Engineers, the American Welding Society and the American Society for Nondestructive Testing.

Attachment 3

SENIOR MECHANICAL ENGINEER - HVAC

K S RAJU K S Raju has over 22 years experience in the power engineering field, both nuclear and fossil. His primary areas of interest have been in the design and specification of gas turbines, waste heat steam systems, and refrigeration systems. He has been with Braun since December 15, 1980, performing engineering design on various HVAC systems for TVA's Hartsville nuclear power station.

While at Burns and Roe, he was the lead mechanical engineer for a pair of gas turbine/waste heat boiler cogeneration units for the City of Santa Clara. The generators produce 8 MWe each, and the boilers each produce 40,000 pounds per hour of 150 psig steam. The combustors are natural gas-fired, with fuel oil as backup. He sized and wrote specifications for the gas turbines, steam generators, deaerators, feedwater treatment equipment, pumps, gas compressors, and instrumentation. He did piping flexibility analysis, and wrote preoperational and start-up procedures. He also engineered the entire steam and condensate distribution system between the city and steam customer, a paper products plant.

In another project, he was the lead mechanical engineer on five 330 MWe combined cycle power plants for Jersey Central Power and Light Company, the Gilbert Station Units 4 through 8. On this assignment, he was responsible for engineering the power cycle piping, cooling water systems, steam and compressed air system, water treatment systems, fire protection, and HVAC. He also wrote installation specifications, and provided engineering assitance during construction and start-up.

While with Ebasco Services Inc, as a senior mechanical engineer he performed a wide variety of functions on two nuclear, two coal-fired, and ten hydroelectric power plants. He was responsible for HVAC, refrigeration, steam, cooling water, and condensate systems, and took a lead role in scheduling and manpower planning for these projects.

Mr Raju is 48 years old, and holds BS and MS degrees in Mechanical Engineering from Michigan Technological University. He is a member of the ASME.

Attachment 3

CHIEF NUCLEAR ENGINEER

R N MOORE Roger Moore has 29 years experience in the nuclear field, including 8 years with Braun. He is presently Braun's Chief Nuclear Engineer, and his expertise and experience are primarily in the areas of nuclear engineering, safety, and licensing.

In his present assignment, he is responsible for all nuclear and environmental aspects of Braun's nuclear power work. On the TVA STRIDE project, he provides design reviews in areas of nuclear safety, health physics, and shielding. He is also responsible for coordination with and reporting to the NRC on all matters of nuclear safety.

His other projects at Braun have included Braun SAR, in which he participated in the design effort, and led the work to produce the PSAR and eventually secure the preliminary design approval from NRC. He also prepares license and permit applications to state and federal authorities on environmental and nuclear matters, responds to questions from regulatory agencies, and gives expert testimony at public hearings.

Prior to joining Braun, Roger was Director of Nuclear Services at Gulf States Utilities. Here he directed the environmental and nuclear efforts on two Louisiana power plants. He coordinated the work of a number of environmental consultants, and published the first Environmental Report based upon the new NRC format.

He was Superintendent of Engineering, Nuclear Division, for Todd Shipyards, where he led the engineering of the retrofit of a modernized design into the nuclear portion of the NS SAVANNAH. He also designed environmental control equipment and did control rod drive analysis for the LOFT project. He was also Manager of Training for nuclear matters at Babcock & Wilcox, where he qualified nuclear ship crews and coordinated various research programs.

Mr Moore has a BA in chemistry from the University of Colorado, and a business management certificate from UCLA. He is a registered nuclear engineer in California.

Attachment 3

SYSTEMS SECTION HEAD
MECHANICAL ENGINEERING DEPARTMENT

F M PATTERSON Pat has 30 years of engineering experience, all at Braun. He is leader of the Systems Section of the Power Division which is composed of the following groups - Mechanical, HVAC and Instrument & Controls. He is responsible for all engineering in the section which includes the complete design of nuclear and fossil power plant systems. This involves preparation of P&I flow diagrams, logic diagrams, hydraulic and thermal calculations, systems, equipment and pre-op specifications, and equipment evaluation and selection. Involved is the complete design including mechanical equipment room layouts, HVAC ductwork drawings, and fabrication specifications. Mr Patterson is responsible for administering the three groups in his Section and providing technical guidance and review of the work.

Pat's other duties have involved the analysis of heat transfer and fluid flow problems of all types. Also process design of such apparatus as heat exchangers, condensers and feedwater heaters.

Mr Patterson has been in the Power Division since 1973. During this time he was responsible for mechanical and HVAC systems in the Reactor Island for TVA's Hartsville and Phipps Bend Nuclear Power stations. He also directed the activities on several other power projects.

Before his assignment to the Power Division, Pat was a Principal Engineer in the Engineering Division. Prior to that he was leader of the HVAC Group at Braun.

Mr Patterson has a BSME from the University of California at Berkeley and MSME and Engineer in ME degrees from the University of Southern California. He is a member of the IEEE Working Group for Unique Identification of Power Plant Systems and Components. He is a registered professional mechanical engineer in California.

Attachment 3

PROJECT QUALITY CONTROL MANAGER

L F KARNS Lee Karns has 39 years of experience including 31 years with Braun.

He is currently head of the Site Quality Control Section of the Quality Engineering Department. In this capacity, he is responsible for coordination of field jobsite inspection activities at various jobsites throughout the world. He maintains liaison with jobsite inspectors and home office engineering. He is responsible for preparing Construction Inspection Plans for construction projects, review of drawings and specifications, and establishment of inspection procedures and checklists to be used at the jobsite. He coordinates with customer representatives in the preparation of the site inspection requirements. He is responsible for the field piping pressure test programs and the preparation of the piping test diagrams that are used at the jobsites.

For 18 years he was Chief Field Inspector. He was responsible for all jobsite construction inspection and quality control activities for field projects ranging to $150 million throughout the world. He was responsible for all site inspection activities for projects in The Netherlands, Trinidad, Australia, and the Philippines. He participated in source inspection activities in Europe and other foreign countries during his overseas assignments. He is familiar with foreign codes and foreign work methods. At the jobsite, he was responsible for soil inspection, concrete control, concrete inspection, welding inspection including procedure and performance qualification, Code pressure vessel fabrication and assembly inspection, inspection of piping fabrication and erection, piping system pressure testing, site metallurgy, inspection of complex materials handling systems, and boiler and furnace inspection. He is particularly qualified in the various techniques of nondestructive examination and code requirements. At the site, he has been responsible for supervising a team of inspection personnel that numbers up to 20 people.

Prior to joining Braun, he was a source inspector for 8 years in various metal manufacturing facilities serving the petroleum industry. He also supervised shop forces in the manufacture of pressure vessels and the fabrication of structural steel.

Mr Karns is 61 years of age. He received his education in Mechanical Engineering at Purdue and Newark College of Engineering.

Attachment 3

EXPERIENCE

TVA STRIDE Braun has been involved in the design of HVAC systems for a 1220 MWe BWR for GE/TVA. The systems have been completely designed, procurement specifications written, and ductwork drawings issued. The majority of the HVAC equipment has been purchased and Braun has provided the review of supplier drawings and the resolution of supplier nonconformances and problems.

Some of the HVAC systems designed by Braun include control room system, standby gas treatment, diesel generator ventilation and other systems similar to those installed at the LaSalle plant.

During the course of our efforts we have sent the HVAC engineer to the construction site to assist in interpreting the design drawings. Some of the problems discussed with construction personnel include methods of supporting and attaching ductwork materials used in fabrication of ductwork and the fabrication procedures.

ROCKY FLATS WEAPONS FACILITY Braun was involved in two major projects for this AEC nuclear weapons facility located near Denver, Colorado. From 1967 to 1970, Braun designed the HVAC systems for a plutonium fabrication/machining operation; office/cafeteria complete; beryllium fabrication facility and the modification and/or extension of the HVAC systems for over 50 of the existing buildings at Rocky Flats. The first project involved the design of HVAC system to control and confine the spread of contamination. The systems controlled the pressure and air leakage between areas of high potential for contamination and those of low potential. Process supply and exhaust systems were designed to maintain an ambient temperature of 70° F and a moisture content of 0.6 grains. The room conditioning systems were of similar design with space conditions of 70° F and 6 grains, an extremely dry condition. The systems were fabricated from carbon steel, galvanized and stainless steel materials.

The second project consists of the design of HVAC systems for a plutonium recovery and waste treatment facility and was accomplished from 1970 to 1981. The processes within this facility consisted of wet chemical operations.

In addition to the systems described above, Braun also designed a large nitrogen recirculating system for a plutonium storage vault, process scrubber exhausts and water spray and removal systems to collect firewater water sprayed on HEPA exhaust filters to prevent criticality conditions.

During this 14 year period, Braun retained a full crew of construction engineers and inspectors to oversee the contractors' operations. In addition, Braun wrote detail system operating procedures, participated in field startup tests and evaluated test results.

The majority of the systems are in operation at this time.

EXPERIENCE Continued Attachment 3

LLL This was a plutonium research laboratory for the LLL in northern California. Many of the systems are similar to those designed for RF but the criteria was based upon the AEC "Minimum criteria for Plutonium handling facility." Braun assisted in the development of this criteria, which required more stringent design based upon safety and seismic concerns addressed in the document.

Braun also reviewed the supplier drawings for this project.

SUNNYVALE ADP and POWER HOUSE These facilities housed the ADP equipment for the US satellite tracking program. The cooling load for this facility varied greatly due to irregular need for satellite tracking. Braun designed a unique variable air volume system utilizing diverting dampers to satisfy this highly variable load. The power house consisted of 11 turbine generators with waste heat boilers and steam absorption refrigerant units which were ventilated with axial fans.

OFFICES FACILITY, HOSPITALS, ETC Up to five years ago Braun had a subsidiary, Kilpatrick & Co, which performed HVAC mechanical contractors and sheetmetal fabrication and erection for large commercial complexes in the Los Angeles area. The facilities were located on the Braun campus in Alhambra and were readily available to the design engineers. They were consulted in past matters detailing with sheetmetal fabrication and installation.

In addition, all A/E services for the Braun facilities at Alhambra and Murray Hill are accomplished with in-house personnel. Over the past years Braun has designed and constructed four, seven to nine story, office buildings in addition to other new and modification work.

Braun acts as their own construction managers for each of these facilities.

PHARMACEUTICAL AND FOOD PROCESSING FACILITIES Braun has designed systems to satisfy FDA requirements for the ventilation of pharmaceutical and food processing facilities. These systems utilize galvanized and stainless ductwork, appropriately caulked and sealed, to confine these potential hazard materials.

ATTACHMENT 4

RESULTS OF SAMPLE ANALYSIS

Sample Number	ASTM* Material Type	System Removed From	System Component	Weight % C	S	P	Mn	Tensile Strength, KSI Calculated Min.	ASTM Min.
1	A36	VE	Hanger	0.19	0.035	0.008	0.68	-	58
2	A527	VC	Duct	0.07	0.027	0.005	0.38	N/A	N/A
3	A36	VC	Hanger	0.15	0.038	0.006	0.69	65	58
4	A575	VC	Stiffner	0.18	0.030	0.009	0.49	N/A	N/A
5	A36	VE	Hanger	0.23	0.038	0.012	0.68	-	58
6	A36	VE	Hanger	0.21	0.026	0.006	0.68	-	58
7	A527	VE	Duct	0.07	0.031	0.006	0.35	N/A	N/A
8	A575	VE	Stiffner	0.16	0.036	0.018	0.56	N/A	N/A
9	A36	VC	Hanger	0.18	0.029	0.006	0.75	69	58
10	A36	VC	Hanger	0.21	0.032 0.033	0.001	0.86	-	58
11	A36	VC	Hanger	0.20	0.041	0.027	0.58	-	58
12	A527	VX	Duct	0.06	0.019 0.018	0.005	0.41	N/A	N/A
13	A36	VX	Hanger	0.18	0.035	0.012	0.62	-	58
14	A36	VX	Hanger	0.16	0.036	0.006	0.68	65	58
15	A36	VX	Hanger	0.18	0.035	0.008	0.54	-	58
16	A36	VE	Hanger	0.19	0.046	0.023	0.73	65	58
17	A36	VX	Hanger	0.19	0.032	0.005	0.61	-	58
18	A575	VX	Companion Flange	0.22	0.051 0.052	0.017	0.58	N/A	N/A
19	A575	VD	Hanger	0.20	0.025	0.007	0.50	N/A	N/A

*All ASTM A575 Samples are specified to be Grade M1020, except sample 41 which was M1015.

ATTACHMENT 4

RESULTS OF SAMPLE ANALYSIS

Sample Number	ASTM* Material Type	System Removed From	System Component	Weight % C	S	P	Mn	Tensile Strength, KSI Calculated Min.	ASTM Min.
20	A527	VD	Duct	0.05	0.025 0.024	0.008	0.35	N/A	N/A
21	A575	VD	Companion Flange	0.23	0.026	0.005	0.52	N/A	N/A
22	A36	VD	Hanger	0.19	0.038	0.008	0.60	-	58
23	A36	VD	Hanger	0.19	0.036	0.009	0.68	6[illegible]	58
24	A575	VD	Stiffner	0.20 0.19	0.026	0.008	0.61	N[illegible]	N/A
25	A36	VY	Hanger	0.20	0.042	0.009	0.64	-	58
26	A575	VY	Stiffner	0.23	0.031	0.008	0.61	N/A	N/A
27	A36	VY	Hanger	0.17 0.18	0.037	0.007	0.56	-	58
28	A575	VY	Stiffner	0.21	0.029	0.008	0.58	N/A	N/A
29	A36	VY	Hanger	0.15	0.048	0.035 0.035	0.72	-	58
30	A36	VY	Hanger	0.21	0.030	0.009	0.72	-	58
31	A527	VD	Duct	0.08	0.02	0.006	0.42	N/A	N/A
32	A527	VD	Duct	0.05	0.02	0.009	0.30	N/A	N/A
33	A527	VD	Duct	0.06	0.02	0.006	0.43	N/A	N/A
34	A527	VY	Duct	0.06	0.03	0.007	0.28	N/A	N/A
35	A527	VY	Duct	0.06	0.02	0.007	0.28	N/A	N/A
36	A36	VY	Hanger	0.17 0.18	0.04	0.006	0.71	66	58

*All ASTM A575 Samples are specified to be Grade M1020, except sample 41 which was M1015.

RESULTS OF SAMPLE ANALYSIS

Sample Number	ASTM* Material Type	System Removed From	System Component	Weight % C	S	P	Mn	Tensile Strength, KSI Calculated Min.	ASTM Min.
37	A527	VX	Duct	0.08	0.03	0.008	0.32	N/A	N/A
38	A307	VX	Bolt	-	0.03	0.011	0.69	145	60
39	A563	VX	Nut	0.05	-	0.009	0.39	97**	68**
40	A575	VX	Hanger	0.21	0.03	0.013	0.65 0.62	N/A	N/A
41	A575	VX	Stiffner	0.16	0.03	0.010	0.42	N/A	N/A
42	A575	VC	Hanger	0.19	0.04	0.018	0.44	N/A	N/A
43	A575	VC	Stiffner	0.19	0.04	0.012	0.32	N/A	N/A
44	A575	VC	Companion Flange	0.13 0.12	0.03	0.016	0.45	N/A	N/A
45	A527	VC	Duct	0.04	0.05 0.04	0.009	0.32	N/A	N/A
46	A527	VC	Companion Flange	0.14	0.04 0.03	0.016	0.42	N/A	N/A
47	A527	VE	Duct	0.09	0.02	0.006	0.40	N/A	N/A
48	A527	VC	Duct	0.07	0.03	0.011	0.33	N/A	N/A
49	A575	VC	Companion Flange	0.14	0.03	0.017	0.45	N/A	N/A
50	A575	VC	Companion Flange	0.13	0.03	0.017	0.46	N/A	N/A
51	A307	VX	Bolt	-	0.02	0.021	-	77	60
52	A563	VX	Nut	0.08	0.03	0.016	0.37	88**	68**

*All ASTM A575 samples are specified to be Grade M1020, except sample 41 which was M1015.

**Proof load stress.

RESULTS OF SAMPLE ANALYSIS

Sample Number	ASTM* Material Type	System Removed From	System Component	Weight % C	S	P	MN	Tensile Strength, KSI Calculated Min.	ASTM Min.
53	A307	VX	Bolt	-	0.02	0.014	-	102	60
54	A563	VX	Nut	0.09	0.02	0.009	0.50	87**	68**
55	A307	VR	Bolt	-	0.02	0.031	-	86	60
56	A563	VR	Nut	0.11	0.01	0.026	0.34	107**	68**

*All ASTM A575 Samples are specified to be Grade M1020, except sample 41 which was M1015.

**Proof load stress.

SARGENT & LUNDY
ENGINEERS
CHICAGO

Attachment 5

NRC REGION III

QUESTIONS ON HVAC SYSTEMS

Question 1: The NRC tested 4 bolts which were 3/8 inch A307 Grade A. The ASTM hardness requirement is between 121 and 241 Brinell. One of the 4 bolts tested had a hardness of 287 Brinell. The chemical analysis was OK. The NRC's lab could not conduct elongation or tensile tests on a 3/8 inch bolt. What does the 287 Brinell hardness mean?

S&L Response: With increasing hardness yield and fracture strength increases and ductility decreases. Increased hardness is advantageous from a strength point of view.

Increased hardness also decreases ductility of the bolt material. However, as no impact loads are expected on HVAC ductwork, this decreased ductility does not affect the safety of the bolts.

Hence, increased hardness is beneficial.

Attached is a list of stresses on the bolts, obtained by conservative analysis of typical HVAC ductwork containing components (dampers, registers, grills, etc.).

Summary of findings for A307 bolts used in HVAC Duct. Companion flange analysis.

Note: 1) The analysis was conservatively based on highest duct and duct component weights.

2) Analysis was based on 3/8 inch bolts.

3) Yield stress for A307 is minimum 36000 psi.

Building - Reactor 1 and 2 Service Level: Emergency

Duct Size (W X H inches)	Calculated Stress (ksi)	Duct Size (W X H inches)	Calculated Stress (ksi)
10 X 6	8.0	30 X 14	7.544
10 X 6	10.0	30 X 20	8.323
12 X 8	9.6	32 X 20	4.633
12 X 10	10.7	36 X 30	9.92
12 X 12	9.6	40 X 20	9.102
14 X 10	10.6	40 X 36	7.995
16 X 16	10.33	42 X 18	7.831
18 X 8	9.76	42 X 36	5.95
18 X 12	9.35	48 X 16	9.76
18 X 14	8.94	48 X 32	5.002
18 X 18	9.92	60 X 40	2.624
24 X 24	10.05	72 X 60	5.084
24 X 18	8.98	96 X 40	6.44
24 X 20	7.18		
26 x 12	8.16		
26 X 14	9.184		
26 X 20	9.963		
28 X 14	9.512		
28 X 20	9.061		

Building - Auxiliary

Service Level: Emvergency

Duct Size (W X H inches)	Calculated Stress (ksi)
10 X 6	10.414
18 X 8	10.91 -
20 X 6	6.81
12 X 16	10.54
12 X 20	10.91
12 X 30	10.62
14 X 40	6.57
18 X 44	9.31
20 X 16	8.57
12 X 36	9.594
36 X 18	8.41
26 X 20	10.62
24 X 54	8.57
48 X 36	8.82
30 X 28	7.75
30 X 38	9.23
22 X 18	7.71
28 X 70	9.512
72 X 72	5.54
40 Ø	9.8
70 Ø	9.23

Building - Containment

Service Level: Emergency

Duct Size (W X H inches)	Calculated Stress (ksi)
12 X 24	8.16
32 X 10	8.1
30 X 32	8.364
18 Ø	9.27

Roger Walkal

3. MATERIALS

3.1 Galvanized Ductwork:

A 122

Material	Material Type	Size	Material Specification	Coating Designation
Sheet	Galvanized Steel	16-gauge and lighter	ASTM A527	ASTM A525 G-90
		14-gauge and heavier	ASTM A526	
Stiffeners, Hangers and Supports	Carbon Steel, Hot dipped Galvanized	2-1/2" x 2-1/2" x 1/4" and smaller	ASTM A575, Grade M-1020	ASTM A123
		3" x 3" x 1/4" and larger	ASTM A36	
Bolts	Galvanized Steel	All	ASTM A307	ASTM A153, Class D, Commercial Coating
Rivets	Galvanized Steel	All	ASTM A152	
Sheet Metal Screws	Galvanized Steel	All	ASTM A568	
Steel Tubing	Carbon Steel Hot dipped Galvanized	All	ASTM A500 Grade B	ASTM A123

3.2 Stainless Steel Ductwork:

Material	Material Type	Size	Material Specification	Coating Designation
Sheet	SS Type 316	All	ASTM A167	No. 1 Hot Rolled Annealed and Pickled with cold reduction Pass
Stiffeners, Hangers and Supports	Carbon Steel, Hot dipped Galvanized	2-1/2" x 2-1/2" x 1/4" and smaller	ASTM A575, Grade M-1020	ASTM A123
		3" x 3" x 1/4" and larger	ASTM A36	
Bolts, Rivets and Miscellaneous Hardware exposed to airstream	SS Type 316	All	ASTM A167	NONE
All other bolts	Galvanized Steel	All	ASTM A307	ASTM A153, Class D, Commercial Coating
All other rivets	Galvanized Steel	All	ASTM A152	
All other screws	Galvanized Steel	All	ASTM A568	

Tel Roger Walkal

As per your request, the above is a list of material specifications used by the HVAC Contractor at the LaSalle Project. I you should have any questions don't hesitate to contact me.

Joseph Dierbeck (Tel # 815-357-6761 ext 503).