FOR BOARD ACTION

Agenda Item # 6. **Meeting Date:** 10/30/07

SUBJECT:

SLP Unit 4 Boiler Emissions Reduction Project
Purchase Order to Babcock & Wilcox for Professional Services

PREPARED BY:

Wally Schlink, Director of Power Resources

ITEM DESCRIPTION:

SLP Unit 4 boiler is a pulverized coal, natural circulation positive pressure boiler that was manufactured by The Babcock & Wilcox Company (B&W) and went into service in December of 1969. The operating conditions of the boiler are 520,000 pounds of steam per hour at 1,350 p.s.i.g. and 955° F.

The Emissions Reduction Project scope includes the installation of a booster fan than will push the exhaust gas from the boiler through the scrubber and baghouse to be treated and eventually out of the chimney. The installation of the fan requires that we take precautions to protect the boiler and related ductwork in the event that the fan could create a negative pressure in those components and potentially cause significant damage to the structure. The changes we are proposing are required by the National Fire Protection Association to meet code and remain in compliance with the standards for boilers of this type.

Due to the technical expertise required, significant safety and environmental issues involved, the level of professional knowledge of this specific boiler, associated equipment, related operational issues, access to drawings, design data and structural analysis the RPU staff and the project engineers, Utility Engineering, is recommending the project as a professional service provided by the original equipment manufacture The Babcock & Wilcox Company.

The attached proposal defines the services that will be provided by The Babcock & Wilcox Company.

Also attached is the recommendation from Utility Engineering recommending award of this work to B&W, copies of the B&W Functional Engineering Review and Analysis of Structural Integrity Final Job Reports that are the foundation of the work. This project is an approved 2007 Capital Project.

UTILITY BOARD ACTION REQUESTED:

Staff recommends that the Board approves a purchase order agreement with The Babcock & Wilcox Company to provide professional services for the supply of graphics and engineered materials to implement the modifications to SLP Unit 4 as defined in the attached Proposal P-008561. The lump sum price for the work is $178,420.

Larry Koshire
General Manager

10/25/07
Date

ROCHESTER PUBLIC UTILITIES

UTILITY ENGINEERING

901 Marquette Avenue, Suite 2900, Minneapolis, MN 55402
612.215.1300 • Fax 612.766.0360 • Web: www.ue-corp.com

October 22, 2007

Mr. Walter Schlink
Director of Power Production
Rochester Public Utilities
4000 East River Road NE
Rochester, MN 55906-2813

Subject: Silver Lake Plant Unit 4 Emissions Reduction Project – Boiler Implosion Protection, UE Project No. 012668
Recommendation to Purchase Professional Services and Associated Engineered Materials from Babcock & Wilcox

Dear Mr. Schlink:

Utility Engineering Corporation (UE) recommends purchase of the required professional services and engineered materials from Babcock & Wilcox (B&W) for implosion protection of Silver Lake Plant (SLP) Boiler #4. We have worked closely with Rochester Public Utilities (RPU) and B&W to develop applicable design criteria for the recently completed implosion engineering study and determined B&W is uniquely positioned to provide the necessary professional services and engineered materials for the SLP Boiler #4 implosion protection.

UE considered, in detail, the B&W study and completed discussions related to technical and commercial issues with RPU and B&W and believe B&W's capabilities reflect best-case value and equipment reliability for RPU. UE also believes B&W's capabilities uniquely and definitively establish a high confidence level in the SLP Boiler #4 implosion protection design. Purchasing these professional services and engineered materials from B&W as a sole source supplier will also allow RPU to maintain the project schedule and take another major step toward a successful project.

B&W Implosion Engineering Study

In May, 2007, UE reviewed the recent changes to the National Fire Protection Association (NFPA) boiler implosion standards and their applicability to SLP Boiler #4 which was originally designed for positive pressure operation. UE determined that the addition of new emissions control equipment had the net effect of altering the operating

conditions of the boiler such that the boiler and its auxiliary systems would potentially be subjected to negative pressure excursions with catastrophic results. To address these transient conditions, the revised NFPA standards require the boiler and its auxiliaries be structurally modified to prevent implosion of the furnace, ductwork, hoppers, etc.

To determine the type and extent of the required structural modifications, UE contracted with B&W on June 7, 2007, to complete an engineering analysis of the future operation of SLP Boiler #4 with a new dry scrubber, pulse jet fabric filter, and induced draft booster fan. B&W's findings were captured in a detailed report and followed by a comprehensive professional services and engineered materials proposal which UE presented to RPU in September, 2007.

Alternative vendors for the implosion engineering study were not considered due to the unavailability of the required technical information and data. B&W is in sole possession of this information due to its proprietary nature making it extremely difficult for alternative vendors to generate an implosion prevention design with the same level of detail and quality.

Recommended Purchase Price

B&W's professional services and engineered materials proposal is for $178,420 and includes the required engineering, drawings, and materials for SLP Boiler #4 implosion protection. The majority of the total cost involves engineering and design services to properly design and document the required materials for the purposes of competitive construction bidding. B&W's material costs are comparatively incidental to the overall design and construction cost.

UE recommends the issuance of a purchase order to B&W for a lump sum price of $178,420. To ensure the necessary drawings are available prior to release of the second mechanical construction package, UE recommends that a purchase order agreement for the professional services and engineered materials be executed by November 2, 2007.

Sincerely,

Roger B. Anderson, P.E.
Senior Project Manager

Daniel J. Carlson, P.E.
Senior Mechanical Engineer

DJC/dlk

The Babcock & Wilcox Company
a McDermott company
2500 Wisconsin Street • Downers Grove, Illinois 60515 USA • (630) 963-0180 • www.babcock.com

October 10, 2007

Mr. Dan Carlson, P.E.
Utility Engineering
901 Marquette Ave, Suite 2900
Minneapolis, MN 55402

Ref: Rochester Public Utilities Silver Lake Unit #4
B&W Boiler Reference S-10209
Proposal P-008561

Subj: Proposal – Graphics & Material for Balanced Draft Conversion

Dear Mr. Carlson:

Following up on the results of our recent engineering study, BA9124178, The Babcock & Wilcox Company is pleased to present the following proposal to provide graphics and material to implement the modifications outlined in the study report for Rochester Public Utilities Silver Lake Unit #4, B&W boiler contract S-10209. These modifications are required to allow the unit to safely operate in compliance with NFPA code under balanced draft conditions, as outlined and discussed in the study report.

The subject boiler is a pressure-fired unit, designed to operate under positive pressure only, and was originally only equipped with a forced draft fan. However, as part of the installation of new emissions reduction equipment, a new induced draft fan is being installed on the unit. While the purpose of the new fan is simply to overcome the additional system loss attributable to the new back end equipment and the unit will still be operated as a pressure-fired unit, per NFPA guidelines, the unit must be capable of withstanding negative pressures.

For further background and details on the purpose and results of the study, please refer to the functional and structural engineering study reports dated September 28, 2007. In the conclusion section on Page 11 of the structural report, a summary of the required modifications to the boiler and other equipment originally supplied by B&W is listed. This proposal offers the required material to implement these modifications along with the graphics engineering to facilitate the installation.

1 Scope of Supply

In accordance with the above discussion, B&W offers the following scope of supply:

1.1 One (1) lot of cover plates for the outer buckstay flange at eleven buckstay elevations.

1.2 One (1) lot of the required additional buckstay standoffs for addition to each buckstay location.

1.3 One (1) new buckstay for the existing front wall tie bar at elevation 1086'-3".

1.4 Two (2) new buckstay end connections for the new front wall buckstay at elevation 1086'-3".

1.5 One (1) lot of structural angle sections as required to reinforce the existing stiffener bars on the windbox and wrap-around windbox.

1.6 One (1) lot of cover plates for the outer flange of the existing channel stiffeners.

1.7 One (1) lot of shear lugs and bars for addition to the ends of the furnace floor support beam to account for uplift of the furnace floor.

1.8 One (1) new arch support channel and one (1) lot of material required to modify the end connection of arch support as required.

1.9 One (1) new furnace roof support with end connections.

1.10 One (1) lot of compression flange stabilizers for the existing roof support

1.11 One (1) lot of compression sleeves for the existing roof support rods.

1.12 One (1) lot of stiffener bars as required for reinforcement of the penthouse casing.

1.13 One (1) lot of cover plates for the existing channel stiffeners on the economizer casing and material to modify the end connections as required.

1.14 One (1) lot of new pipe tie stabilizers for the economizer casing.

1.15 One (1) lot of structural material as required to reinforce the existing stiffener bars on the economizer casing, economizer hopper casing and generating bank casing.

1.16 One (1) lot of cover plates for the outer flanges of the existing S5x10 beam at the boiler gas outlet

1.17 One (1) lot of structural material as required to reinforce the existing stiffener bars on the boiler gas outlet.

1.18 One (1) lot of graphics engineering to create erection arrangement drawings showing the required additions / modifications and to facilitate installation.

2 Exceptions and Clarifications

The proposed scope of supply does not include the following:

2.1 Any controls or instrumentation related to the new NFPA compliant furnace pressure control system or otherwise.

2.2 Any graphics or material related to the other equipment on the unit that was not part of B&W's original equipment scope of supply and therefore not included in B&W's recent structural study.

2.3 Any detail or shop level drawings. All drawings provided will be arrangement or erection arrangement level drawings to facilitate installation of the proposed material scope of supply.

2.4 Any field demolition, erection or on-site support by B&W Field Engineering Services.

2.5 Any demolition or erection labor or tools.

3 Price, Delivery, Terms and Conditions

The Babcock & Wilcox Company offers to provide the scope of supply outlined above for the firm price of $178,420 (ONE HUNDRED SEVENTY EIGHT THOUSAND FOUR HUNDRED TWENTY DOLLARS). The estimated lead time for delivery of all equipment is 16 weeks after receipt of an order.

The above offer is FOB shipping point, exclusive of freight and valid for sixty days from the date of this proposal. This offer is subject to The Babcock & Wilcox Company's comments and exceptions contained in the document labeled "BW TC comments 06-11-07.doc" to the document labeled "Equipment Supply T&C Rev 1.pdf". These documents represent the level to which preliminary negotiations have proceeded at this point. A final, clean Terms and Condition document will need to be established and agreed to in order to begin work on this project.

If you have any questions regarding this proposal, please do not hesitate to contact us.

Sincerely yours,
THE BABCOCK & WILCOX COMPANY

Michael Vanco, Jr.
Principal Engineer
Midwest Field Service

c: DB Pearson – B&W Midwest Service
LM Polster - B&W Midwest Service
KJ Latendresse – B&W Sales

The Babcock & Wilcox Company

Generating Powerful Solutions™

a McDermott company

EQUIPMENT SUPPLY
TERMS AND CONDITIONS OF SALE (DOMESTIC)
WITH UTILITY ENGINEERING

B&W'S Proposal is based solely on the pricing and terms and conditions included with B&W'S Proposal and on the following terms and conditions. Notice of objection to additional or different terms and conditions is hereby given to BUYER. BUYER agrees that B&W'S Proposal shall constitute the complete and final agreement between B&W and BUYER with respect to this transaction. Any modification to B&W'S Proposal shall only be effective when evidenced by a written instrument signed by an authorized representative of B&W and delivered by B&W to BUYER. Any Equipment received by BUYER from B&W shall be deemed to be delivered solely on the terms and conditions contained in B&W'S Proposal.

1. **DEFINITIONS** - The following terms shall have meanings given below. Words importing persons include corporations. Words importing the singular include the plural and vice versa when the context requires.

a. B&W - "B&W" shall mean The Babcock & Wilcox Company, a Delaware, USA corporation with offices at 20 South Van Buren Avenue, Barberton, Ohio 44203-0351.

b. **BUYER** - "BUYER" shall mean the person, Company or Corporation that this Proposal is being submitted W.

c. **Contract** - "Contract" shall mean the mutually acceptable agreement signed by authorized representatives of B&W and BUYER for the performance of the Work

c. **Equipment** - "Equipment" shall mean all the equipment, materials and accessories to be furnished by the B&W as specifically delineated in the B&Ws Proposal.

d. **Plant Site or Site** - "Plant Site" or "Site" shall mean the property site where the Equipment will be delivered.

e. **Property** - "Property" shall mean all real and personal property except the Equipment or Work furnished under this Contract.

f. **Technical Advice - On-Site Technical Advisor** - "Technical Advice" or "On-Site Technical Advisor" or similar terms in the Contract shall mean technical advice and consultation given to BUYER'S supervisory staff or operating personnel but excludes any and all supervision or management of BUYER'S employees, agents or subcontractors and excludes any and all operation or supervision of operation of the Equipment or other BUYER owned equipment

g. **Work or Scope of Supply** - "Work" or "Scope of Supply" shall mean the Equipment, supplies, material, labor (if erection by the B&W is specifically included in the Contract) and services to be provided under this Contract and accompanying documents and the carrying out of all duties and obligations imposed therein.

2. **PROPOSAL INFORMATION** - Only that Equipment, expressly included in B&W'S Proposal, shall be furnished. The dimensions, Proposal drawings, typical illustrations, weights, materials, and details of construction included herein, while representing the best information available at the time of the issuance of this Proposal, may vary from that set forth during the development of the final design under terms of contract. Such drawings as are included in this Proposal are intended only to illustrate the arrangement of equipment and are not to be construed as defining the extent and scope of the material B&W proposes to furnish.

3. **PROPRIETARY INFORMATION** -B&W'S Proposal, including any drawings submitted pertaining thereto, is the property of B&W; it contains confidential information and is loaned to the BUYER on condition that he and his representatives have, by receiving it, agreed to maintain its confidentiality.

BUYER understands that special techniques in the arts and sciences, developed or accumulated by B&W at its own time and expense, will be employed to benefit the BUYER under this Contract, and agrees that such special techniques are proprietary and shall not be disclosed to any third party during or subsequent to the term of this Contract without B&W'S prior written consent, provided, however, that nothing herein shall eliminate the BUYER'S right to disclose any data provided by B&W hereunder which (a) was furnished by B&W prior to this Contract without restrictions; (b) becomes knowledge available within the public domain; (c) is received by the BUYER from a third party without restriction and without breach of this Contract; or (d) is required to be disclosed by law, provided BUYER gives B&W prompt written notice of the demand for disclosure.

The BUYER may retain the Proposal for use in connection with the Equipment covered by the Contract and for purposes of the Contract make copies thereof as may be necessary for internal use. In no event will B&W'S information be provided by BUYER to any third parties without B&W'S prior written consent.

4. LIMITATION OF **PROPOSAL** - B&W'S Proposal is valid for 30 days from the date thereof, except that B&W shall have the right to withdraw its Proposal at any time before formal written acceptance is received by B&W from the BUYER and subsequently accepted in writing by an authorized representative of B&W.

5. **PRIOR SALE** - B&W' S Proposal for the Equipment and/or services is based on the availability of engineering, manufacturing, service and support manpower, fabrication and operating material availability, shop space and manufacturing facilities to perform the services and fabrication described herein and the availability of field craft labor. In the event that another sale which utilizes this manpower, material or facilities and field craft labor is made prior to a mutually acceptable award of Contract and full release to proceed, B&W reserves the right to withdraw or to amend its Proposal accordingly.

6. MATERIAL **AVAILABILITY** - B&W'S Proposal is based on current availability and prices of materials. If, prior to acceptance of its Proposal, B&W determines that its schedule or price will be adversely affected by shortages of materials or increases in the cost thereof resulting from the imposition of restrictions on material imports by the U.S. government or other causes beyond the control of B&W, B&W reserves the right to withdraw or amend its Proposal.

7. **SHIPPING POINTS/TRANSPORTATION CHARGES** - The F.O.B. point for the Proposal is B&W'S shops and supplier's shops. Should the BUYER elect to include transportation charges in the work scope of supply to the F.O.B. point specified by the BUYER, then transportation charges shall be paid by the BUYER. In any event, upon arrival of equipment on board carrier at destination, the BUYER shall be responsible for any demurrage, towboat, or ship standby service, and any transshipment. Further, BUYER shall assume any additional cost resulting from changes in currently existing facilities and clearances. Routing and type of transportation shall be controlled by B&W.

8. DELAY IN **PERFORMANCE** - The B&W shall not be liable for any expense, loss or damage resulting from delay or prevention of performance caused by fires, floods, Acts of God, strikes, labor disputes, labor shortages, lack of or inability to obtain materials, fuel, supplies or other equipment, riots, acts of terrorism, thefts, accidents, transportation delay, acts or failure to act of Government or BUYER, delay in obtaining licenses, major equipment breakdown, or any other cause whatsoever, whether similar or dissimilar to those enumerated above, beyond the reasonable control of B&W. In the event of any delay arising by reason of the foregoing, the time for performance shall be extended by a period of time equal to the time lost by reason of such delay.

9. WARRANTY - B&W'S warranty with regard to Equipment furnished by B&W is as follows:

B&W warrants that the Equipment supplied under this Contract shall be free from defects in workmanship and materials for a period of one (1) year from the date of first use or eighteen (18) months after shipment ofB&WS Equipment, whichever occurs first.

In event of non-compliance with this Warranty, B&W shall, at its option, modify, adjust, repair or replace F.O.B. point, any part or parts of the Equipment which are proven to be defective in workmanship and materials. B&W shall not be liable for any transportation charges on parts returned for modification, adjustment, repair or replacement or any costs or charges associated with the removal or reinstallation of any such part or parts nor shall B&W supply any labor for removal or reinstallation.

If B&W cannot or does not modify, adjust, repair or replace a part which is defective in workmanship and materials within a reasonable time after written notice of such defect is received by B&W, or if an emergency exists rendering it impossible or impracticable for the BUYER to have the work performed by B&W, the BUYER, after written notice to B&W, may make or cause to

be made such modification, adjustment, repair or replacement, in which case B&W will reimburse the BUYER for the reasonable cost thereof, exclusive, however, of any charges for removal or re-installation.

This Warranty does not cover the effects of normal wear, tear, deterioration or abuse of the Equipment; or the effects of abrasion, erosion, or corrosion; or the effects of improper storage or erection (if not within B&WS scope of work hereunder); or operation or maintenance not in accordance with B&W'S Operating Instructions and other conditions of service specified, and in accordance with generally accepted utility practice.

B&W shall not be responsible for equipment or parts furnished by others or repairs or work done by others unless the same is specifically ordered by B&W.

The sole liability ofB&W and the exclusive remedy of the BUYER arising out of the manufacture, sale, furnishing of the Equipment hereunder or its use whether arising under contract, tort (including negligence), strict liability, or otherwise, shall be the modification, adjustment, repair or replacement as set forth above.

B&W AND BUYER AGREE THAT, IN CONSIDERATION OF THE ABOVE EXPRESS WARRANTY AND THE PERFORMANCE GUARANTEE(S), ALL OTHER WARRANTIES AND GUARANTEES, OTHER THAN TITLE, EITHER EXPRESSED OR IMPLIED, WHETHER ARISING UNDER LAW OR EQUITY OR CUSTOM OF THE TRADE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXCLUDED FROM THIS CONTRACT.

10. **TECHNICAL ADVISOR AND TRAINING WARRANTY** - B&W warrants that the services provided by the Technical Advisor and the training (if any) provided by B&W will be done in a professional manner consistent with B&W'S standard practices and procedures and consistent with customary standards of companies that supply and install steam generation equipment, environmental equipment and related auxiliary equipment. If within one (1) year from completion of the services performed, the BUYER notifies B&W, in writing, the service did not comply with such warranty, B&W shall, as its sole obligation and as the BUYER'S sole and exclusive remedy, reperform such services at B&W'S expense.

B&W AND BUYER HEREBY AGREE ALL OTHER WARRANTIES EITHER EXPRESSED OR IMPLIED, WHICH MIGHT ARISE UNDER LAW OR EQUITY OR CUSTOM OF TRADE, INCLUDING WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR SPECIFIED OR INTENDED PURPOSE ARE EXCLUDED FROM THIS CONTRACT.

11. INDEMNITY - B&W agrees to defend, indemnify and hold harmless the BUYER from any claim, demand, suit, loss, cost or expense or any damage which may be asserted, claimed or recovered against or from the BUYER by reason of any damage to third party property or bodily injury, including death, sustained by any person or persons whomsoever provided such damage, injury or death occurs and is manifest although not acted upon during the performance of the field construction work at the jobsite to the extent such damage injury or death is caused by the negligent acts or omissions ofB&W. In no event shall this indemnity obligation apply to damage, injury or death to the extent resulting from the negligent acts or omissions of the BUYER or any other party. This contractual indemnity obligation terminates two years after the completion of field construction work or the expiration of the warranty period, whichever occurs first.

12. DRAWINGS - The BUYER shall furnish B&W with all information, instrumentation, and drawings requisite to the execution of the Work. The B&W shall furnish the BUYER only those general arrangement drawings as are necessary for the Work contemplated hereunder. In no event shall B&W be obligated to furnish the BUYER "shop" or "detail" drawings, or any other proprietary information.

13. PATENT INDEMNITY - B&W shall defend at its own expense any suit or action brought against the BUYER based on a claim that any individual piece of Equipment designed by B&W and furnished hereunder, constitutes direct infringement of any patent of the United States granted prior to the date of submission of this Proposal, and B&W shall also pay all costs and damages awarded therein against the BUYER. In case such B&W-designed Equipment is in such suit held to constitute infringement and its use is enjoined, B&W shall at its own expense either procure for the BUYER the right to continue using said Equipment or replace same with non-infringing Equipment; or modify it so it becomes non-infringing; or remove said Equipment and refund the purchase price.

Where the BUYER has given written instructions to B&W which direct (1) a specified manner or performance of the contract or (2) a specific design or arrangement of the Equipment or a part or parts thereof to be furnished hereunder, the BUYER shall defend at its

own expense any suit or action based on a claim that the Equipment or a part thereof furnished hereunder constitutes infringement of a United States patent, where such infringement results from such written instructions, and the BUYER shall also pay all costs and damages awarded therein against B&W. The foregoing sets forth the entire liability of B&W with respect to patent infringement.

Neither the BUYER nor B&W shall have the right to claim indemnity under this paragraph unless prompt notice of the assertion of any claim for which indemnity is sought is given in writing and unless the party seeking indemnity makes available to the other party all other needed information, assistance, and authority it possesses for the defense of any suit or proceeding in which such claim is asserted.

14. **TITLE** - Title to and a security interest in each item of Equipment and Work delivered hereunder is hereby reserved in B&W until full payment for such item has been made.

15. **RISK** OF **LOSS** OR DAMAGE - Risk of loss of or damage to the Equipment shall pass to the BUYER upon arrival of the Equipment or any portion thereof F.O.B. point of B&W'S selection. From the date that risk of loss of or damage to the Equipment passes to the BUYER as provided above, and until the Contract Price is paid in full and all obligations of B&W hereunder have terminated, the BUYER shall, by insurance or otherwise, assume the complete risk of loss of or damage to the Equipment no matter how caused and shall hold B&W harmless from any such liability.

16. **TAXES** - The Contract price includes all Federal, State, and local taxes levied on wages and salaries of employees payable directly by B&W by law. The prices provided for herein are exclusive of any present or future federal, state, municipal or other sales or use tax with respect to the material, equipment or services covered hereby, of any other present or future excise tax upon or measured by the gross receipts from this transaction or any allocated portion thereof or by the gross value of the material, equipment or services covered hereby and of any present or future property tax or other similar charge with respect to the material, equipment or services covered hereby. IfB&W is required by applicable law or regulation to pay or collect any such tax or taxes on account of this transaction or the material, equipment or services covered hereby, than such amount of tax shall be paid by the BUYER in addition to the prices provided for in the Contract.

17. **TERMS** OF PAYMENT - The Contract price and terms of payment shall be in accordance with the latest price quotation from B&W to the BUYER. The prices quoted by B&W are exclusive of collection charges to B&W. Unless otherwise stated in the price quotations, the prices quoted do not include the services of a Technical Advisor or training.

For purposes of payment, shipment is defined as the date of scheduled shipment.

Invoices will be issued by B&W monthly and payments shall be due and payable within 30 days of the date of the invoice. Upon written request by the BUYER to B&W, B&W will submit B&W'S standard waiver of lien form with the final invoice.

18. **INTEREST ON PAST DUE ACCOUNTS** - Should any payments) due hereunder not be made as it becomes due, the BUYER shall commence paying interest on the outstanding payments) at the rate of 1.5% of the invoice amount for each month or part thereof until said payment is received.

19. B&W **INSURANCE** - B&W shall provide and maintain until completion of the Work the following forms of insurance with respect to B&W'S employees.

	Type of Coverage	Limits of Liability
(1)	Workmen's Compensation Employer's Liability	Statutory $2,000,000
(2)	Public Liability: Bodily Injury & Property Damage	$2,000,000 each occurrence $5,000,000 aggregate
(3)	Automobile Liability: Bodily Injury and Property Damage	$2,000,000 combined single limit

(4) Builder's Risk Insurance can be provided by B&W at additional cost to BUYER. Any Builder's Risk Insurance not provided by B&W must name B&Was additional insured and provide a waiver of subrogation in B&WS favor.

Certificates evidencing that the above insurance is in force will be forwarded to the BUYER upon written request prior to arrival at the site.

20. LIMITATION OF **LIABILITY** - Notwithstanding any other provisions of this Contract, neither B&W nor its subcontractors shall be liable, whether arising out of contract (including the failure of essential purpose of any remedies), tort (including negligence), strict liability, or any other cause of or than of action whatsoever, for loss of anticipated profits, loss by reason of plant or other facility shutdown, non-operation or increased expense of operation, service interruption, cost of purchased or replacement power, claims of BUYER'S customers, subcontractors, vendors or suppliers, cost of money, loss of use of capital or revenue, fines or penalties assessed or levied against the BUYER by any governmental agency based on the operation, non-operation, or use of the Equipment or for any special, incidental or consequential loss or damage of any nature, whether similar or dissimilar to those enumerated above, arising at any time or from any cause whatsoever.

The total liability of B&W and its subcontractors, whether arising out of contract, tort (including negligence), strict liability, or any other cause of or than of action, shall not exceed the date of sale Contract Price.

Except as to warranty of title to any goods furnished, all B&W liability shall terminate upon the expiration of the warranty period specified in the Contract, provided, however, that BUYER may enforce a claim of such liability by an action timely commenced in a court of competent jurisdiction in accordance with the applicable statute of limitations and/or statute of repose, but in no event later than one (1) year after expiration of the warranty period.

21. PERFORMANCE GUARANTEE DISCLAIMER - B&W represents that it will supply the Equipment described herein in accordance with its standard technical procedures and practices. However, as a condition of this offer, B&W and BUYER realize that the performance of the Equipment to be supplied hereunder and its influence on other associated equipment cannot be exactly predicted. THEREFORE, **ANY PERFORMANCE INFORMATION CONTAINED HEREIN IS SUBMITTED** AND **SET FORTH FOR THE BUYER'S CONVENIENCE ONLY AND IS NOT OFFERED BY B&W, NOR SHALL THE BUYER CONSTRUE IT, AS EITHER AN EXPRESSED WARRANTY OR AN IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

INASMUCH AS OPERATION OF THE EQUIPMENT FURNISHED HEREUNDER IS TO BE WITHIN THE CONTROL OF BUYER, AND B&W HAS EXCLUSIVELY SET OUT HEREIN ITS GUARANTEES, IF ANY ARE MADE BY B&W, NO OTHER GUARANTEE, WARRANTY, OR REPRESENTATION IS MADE OR TO BE IMPLIED THAT THE OPERATION OF EQUIPMENT TO BE SUPPLIED HEREUNDER WILL COMPLY WITH FEDERAL, STATE, OR LOCAL LAWS OR REGULATIONS GOVERNING ENVIRONMENTAL IMPACT.

22. **INSPECTION** - The BUYER may inspect, or provide for inspection, at the place of manufacture. BUYER'S inspector shall be deemed the agent of BUYER with authority to waive specified tests and details of test procedure and to accept products as conforming to this contract with respect to all characteristics of such products for which such inspection is made. Inspection shall be so conducted as not to interfere unreasonably with the manufacturers operations.

23. **OPERATION OF EQUIPMENT** - B&W'S personnel are authorized only to advise and consult with the BUYER and are not licensed or authorized to operate BUYER'S equipment. All operation of BUYER'S equipment, including testing, shall be performed by, under the control of, and at the expense of the BUYER.

24. **TECHNICAL INTERCHANGES** - During the performance of this Contract, whether or not required by the Contract specifications or requested orally or in writing by the BUYER, B&W may: review and/or comment on information, drawings, data or specifications developed by the BUYER; provide technical information or make recommendations relative to the overall project though not directly required to permit completion of B&W'S scope of supply hereunder, predict, approximate or advise the suitability of changes in conditions or alternate operating modes relative to the equipment supplied hereunder. In any such event, any recommendations, advice, predictions, or technical data supplied by B&W will be for information only. In no event shall B&W be liable, whether arising under contract, tort (including negligence), strict liability or any other than of or cause of action whatsoever, for any loss or damage with respect to use of or damages resulting from the use of any such recommendations, advice, predictions or technical data.

25. **CHANGES** -Any change in specification or proposed work requested by BUYER will be subject to approval by B&W. Such agreement on change shall include agreement on change in Contract price, delivery date, and any other terms of the order which may be affected by such change.

26. **PERMISSIBLE VARIATIONS** - Unless otherwise agreed upon in writing, all Equipment shall be furnished subject to B&W standard manufacturing variations and practices. Over shipment of Equipment resulting from the production of B&W non-standard equipment and directly as a result of the BUYER'S order will be accepted by BUYER at unit prices provided by B&W in its price quotations.

27. **SUBSTITUTION** OF MATERIALS - The substitution of materials or components may be required in order to meet the Contract schedule or minimize delays. Should such substitution be required, either from domestic or international sources, the BUYER will be notified and will be given the option to either pay the additional cost of such substitute materials or components, if any, or accept a schedule extension.

28. NUCLEAR **HAZARD** - Should Equipment hereunder be incorporated into a nuclear facility, neither B&W nor any of its suppliers assume any liability whatsoever for any form of injury or damage, whether to persons, property, or the Equipment furnished hereunder, caused directly or indirectly by nuclear incident and whether arising out of the performance of this contract or the use of the Equipment and the BUYER and/or ultimate user hereby indemnifies and shall hold harmless B&W, its suppliers and subcontractors against all losses, claims, damages or liabilities arising out of or based upon personal injury (including death at any time resulting therefrom) and loss of or damage to any property located on or off the site whenever or wherever occurring. The BUYER and/or the ultimate user and their insurers hereby waive any rights of recovery or subrogation which the BUYER, ultimate user, or insurer might have or acquire against B&W.

29. **PERMITS** - Where Federal, State, Municipal or other regulatory authorities, laws, ordinances and regulations require permits to install or operate equipment covered by this Contract or the approval of the plans and specifications for the installation, the BUYER shall be responsible for securing the permits and the approval of said plans or specifications from the proper authorities and for any required fees. If any changes are required in the equipment covered hereby to meet such requirements, the BUYER shall inform B&W of such changes and if such changes can be practicably accomplished, B&W will make such changes and the contract price, the schedule, and other affected provisions of the Contract shall be subject to appropriate adjustment.

30. **CODES** AND **REGULATIONS** - The pressure parts, if any, furnished under this Contract shall be designed and fabricated in accordance with the applicable sections of the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers including all published Addenda and interpretations thereto in effect as of the date of B&W'S Proposal.

The balance of the Equipment furnished under B&W'S Proposal shall be designed and constructed in accordance with the current editions of the following listing in effect as of the date of B&W'S Proposal and where applicable to the scope of Equipment supplied by B&W.

ASTM	American Society for Testing Materials
RISC	American Institute of Steel construction
ANSI	American National Standards Institute
SSPC	Steel Structures Painting Council
NFPA	National Fire Protection Association
ISO	9000

The Equipment furnished by B&W will comply with the requirements of the Occupational Safety and Health Act in effect as of the date of B&W'S Proposal except with respect to sootblowers, noise levels and floor hole openings if steam generation equipment is being provided.

Since the site and other environmental conditions are both unknown and beyond the control of B&W and relative locations of equipment not furnished by B&W enter into noise level measurements, any noise level data submitted by B&W or its vendors to the BUYER shall be considered informative only and shall not be construed as a warranty or guarantee that the equipment or any component thereof will, in service, comply with any noise level rules and regulations including those of OSHA and the Walsh-Healey Act. Cooperation between the BUYER, the BUYER'S Engineers and B&W in the arrangement of equipment will be utilized in the design stage in efforts to achieve compliance with noise level rules and regulations, provided that the Contract price and schedule shall be subject to appropriate adjustment should equipment re-arrangement be required.

31. **FOUNDATIONS** - B&W shall provide the BUYER with general arrangement drawings showing the Equipment with reference to foundations, including loading diagrams and showing location of anchor bolts in the foundations. Adequate foundations, having plan measurements in accordance with such drawings including foundation bolts and plates, concrete work, all grouting and excavation, shall be furnished in place in due time by the BUYER. B&W shall not be responsible for the depth of the footings, size or accuracy of the foundations, or the character of the materials selected for their construction or for any damages, or repairs necessary to the Equipment furnished by it, caused by or resulting from defects in or settlement of the foundations.

32. **STEELWORK** - Unless otherwise stated, any supporting steel to be furnished by B&W as specified in B&W'S Proposal will be designed to support the Equipment which B&W proposes to furnish and will be designed in accordance with the latest Rules of the American Institute of Steel Construction. If B&W is required to increase the size or weight of its supporting structures to conform to other than these Rules or because of additional loadings imposed by the BUYER, the BUYER shall reimburse B&W for the additional steel required.

33. **ASSIGNMENT** - Neither B&W nor the BUYER may assign all or any part of this Contract without the prior written consent of the other party unless such assignment is made to a parent company or to a successor by way of merger, consolidation or the acquisition of substantially all of the assets of the assigning party. In the event of an assignment, the assignee shall expressly assume the obligations of the assigning party in writing. Any assignment in violation of this article shall be null and void.

34. **SET** OFF - In no event shall the BUYER be entitled at any time to set-off against any amount payable by the BUYER in connection with this Contract any amount owed or allegedly owed by B&W to the BUYER arising from this or any other transaction between B&W and the BUYER or his predecessors or successors in interest.

35. **WAIVER** - No waiver of any breach of any provision of this Contract by either party shall be considered as a waiver of any other or subsequent breach.

36. **BACKCHARGES** - The B&W shall not be called upon to make any allowance for material, labor, repairs, or alterations made for its account unless authorized by it in writing.

37. TERMINATION - The BUYER may terminate the Contract only upon written notice and upon payment to B&W of reasonable and proper termination charges. Such charges shall include direct labor and material expenses; all vendor termination charges; engineering and drafting expense (based on the percentage of completion of the engineering and drafting work); development engineering specially incurred for the terminated contract including special tools, dies, fixtures and patterns; all other direct costs properly allocable and apportionable to the contract.

The BUYER shall be entitled to all material specially accumulated for the order and included in the above charges, shipped at its expense, or, at its option, the salvage value thereof shall be deducted from the termination charges. The BUYER may, at its option and expense, have B&WS firm of independent auditors conduct an independent examination and certify that the charges are in accordance with B&WS standard accounting practice. All termination charges are due and payable on submission ofB&WS invoice therefor.

38. **GOVERNING** LAW; **VENUE** - This Contract shall be interpreted in accordance with and governed by the internal laws of the State of Minnesota. Each party hereby irrevocably and unconditionally submits for itself and its property in any legal action or proceeding relating to this Contract or the performance hereof or for recognition and enforcement of any judgment in respect thereof, to the exclusive jurisdiction of the State of Minnesota, and any federal court located in the State of Minnesota and consents and agrees to suit being brought in such courts.

39. **DISPUTE RESOLUTION** - The parties shall attempt in good faith to resolve all disputes promptly by negotiation, as follows: either party may give the other party written notice of any dispute not resolved in the normal course of business. Executives of both parties at levels one level above the project management personnel who have previously been involved in the dispute shall meet at a

mutually acceptable time and place within ten days after delivery of such notice, and thereafter as often as they reasonably deem necessary, to exchange relevant information and to attempt to resolve the dispute. If the matter has not been resolved within thirty days from the referral of the dispute to senior executives, or if no meeting of senior executives has taken place within fifteen days after such referral, either party may initiate mediation as provided hereinafter. If a party intends to be accompanied at a meeting by an attorney, the other party shall be given at least two weeks' notice of such intention and may also be accompanied by an attorney. All negotiations pursuant to this clause are confidential and shall be treated as compromise and settlement negotiations for purposes of the Federal Rules of Evidence and state rules of evidence. Each party will bear its own costs for this dispute resolution phase.

In the event that any dispute arising out of or relating to the Contract Documents is not resolved in accordance with the procedures set forth in Section 16.1, such dispute shall be submitted to mediation to a mutually agreed on mediators. The mediation shall take place at BUYER'S facilities unless otherwise agreed to by the parties. If the mediation process has not resolved the dispute within thirty days of the submission of the matter to mediation or within such longer period as the parties may agree to, the dispute shall be decided by litigation. Each party will bear its own costs for any dispute resolution, including litigation.

40. ADDITIONAL MATERIALS - Additional permanent materials, subcontracted work or expendable supplies furnished by B&W at BUYER'S request shall be billed to the BUYER at cost plus percent.

41. **NOTIFICATION OF CLAIMS** - The BUYER shall notify B&W immediately by Registered Mail addressed to B&W, c/o Legal Department, The Babcock & Wilcox Company, 20 S. Van Buren, P.O. Box 351, Barberton, OH 44203-0351, of all claims brought against the BUYER for which B&W may be liable; and B&W shall notify the BUYER immediately by Registered Mail addressed to the BUYER at its principal office of all claims brought against B&W for which the BUYER may be liable.

42. **THIRD PARTY BENEFICIARIES** - No provision of this Contract is intended or shall be construed to be for the benefit of any third party, except as provided herein with respect to B&W'S subcontractors.

43. **SUPPLY FROM NON-USA SOURCES** - The B&W reserves the right to obtain portions of the Equipment to be furnished hereunder from non-USA sources. Wherever possible, such Equipment will be obtained from B&W'S international affiliated companies. In any event all such Equipment shall be supplied in accordance with B&W'S requirements and shall be fully warranted by B&W to the BUYER in accordance with the Warranty provision of the Contract.

44. **INCOTERMS 2000** - All references herein to terms of trade shall be interpreted in accordance with Incoterms 2000.

45. CHANGE IN LAW - If there is any change in law, regulation, procedure, legislation, governing rules, taxation (whether new or an increase in an existing tax), or if there is a change in the enforcement practices of any of the foregoing by any federal, state, or local governmental authority or quasi-governmental authority which adversely affects B&WS costs, schedule, or performance, then both the contract price and the schedule shall be subject to adjustment.

46. INTEGRATION - B&W'S Proposal and any resulting Contract are based solely on the BUYER'S acceptance of the terms and conditions set forth herein and the BUYER is hereby notified that B&W expressly objects to any additional or different terms and conditions which may be contained in any purchase order issued pursuant hereto. The BUYER agrees that B&W'S Proposal and these terms and conditions constitute the entirety of the Contract between B&W and the BUYER and all previous communications, whether verbal or written, are hereby abrogated and withdrawn. The parties agree that the issuance of a change order or purchase order is expressly conditional on these Equipment Supply Terms and Conditions. No additional terms and conditions contained in a BUYER'S purchase order or change order shall apply unless expressly accepted in writing by an authorized representative ofB&W.

47. **EXECUTION** OF CONTRACT - B&W'S Proposal shall become the Contract between the BUYER and B&W when accepted by the BUYER and when subsequently accepted only by a representative of B&W so authorized by its Board of Directors. It shall then be binding upon the parties hereto and upon their respective successors and assigns.

Final Job Report

Functional Engineering Review

for

City of Rochester Public Utilities
Silver Lake Unit #4

B&W Contract No: S-10209

Submitted by

The Babcock & Wilcox Company
Generating Powerful Solutions℠
a McDermott company

September 28, 2007

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Functional Engineering Review

Pressure Study for City of Rochester Public Utilities

Silver Lake Unit #4
Rochester, MN

BACKGROUND

Currently operating a pressure-fired Stirling Power Boiler, The City of Rochester Public Utilities plans to add back end equipment and thus an ID fan to overcome pressure loss through the added equipment (Figure 1). While Rochester Public Utilities plans to continue operating the unit as pressure-fired, per NFPA 85 standards once an ID or booster fan is added to the unit, it is then considered "balanced draft" and must be able to withstand applicable negative pressures.

The purpose of this Functional Engineering Review is to provide continuous and transient design pressures for the entire unit.

ANALYSIS

All B&W design pressure calculations are compliant with NFPA 85 Boiler and Combustion Systems Hazards Code.

Continuous design pressure is essentially the normal operating pressure of the equipment with a margin added. Transient design pressure represents a momentary pressure that might occur under an abnormal set of circumstances; i.e. it is the continuous design pressure with an additional margin.

Because this unit will operate with an NFPA 85 compliant Implosion Protection System, a minimum continuous design pressure of ±10 in wg must be employed for all pieces of equipment. Ultimately, the continuous design pressure is the test block condition less the draft loss associated with each piece of equipment or the minimum, whichever results in a more conservative design.

For the transient design pressure calculations, NFPA 85 standards require that the fan test block condition be corrected to ambient temperature in certain cases. Table 1 below lists situations in which this is necessary.

	Positive Transient Design	Negative Transient Design
Duct and flue work under positive pressure	FD fan test block condition corrected to ambient	-10 in wg
Duct and flue work under negative pressure	+10 in wg	ID fan test block condition corrected to ambient
Furnace	FD fan test block condition corrected to ambient	ID fan test block condition corrected to ambient

Table 1: Detail of situations which require ambient temperature correction of the test block condition. NOTE: Table 1 applies only to this particular unit.

Design pressures were calculated based on the following assumptions:

- Forced draft fan test block condition of 31.1 in wg (from data originally supplied by B&W)
- Induced draft fan test block condition of 15.0 in wg (from ID fan curves)
- Pressure drops associated with environmental equipment that were utilized in calculations were supplied by Utility Engineering

- The given flue exit gas flow for the unit was larger than the original design, therefore the pressure losses through the flues, ducts, and furnace were adjusted accordingly
- Since the unit is to be operated as pressure-fired, the "balance zone" or point of atmospheric pressure within the unit was assumed to be the flue exiting the air heater
- NFPA 85 Implosion Protection will be installed on the unit at the time of balanced draft conversion

Documented on p 5-7 are charts (Figures 2-5) that supply both the continuous and transient design pressures of the individual pieces of equipment throughout the unit.

Eq. #	Equipment	Eq. #	Equipment
1	Duct - FD Fan to SCAH	12	Economizer
2	SCAH	13	Flue - Econ to AH
3	Duct - SCAH to AH	14	AH flue side
4	AH air side		
5	Duct - AH air outlet to split	16	SDA
6	Duct - Secondary Air to Windbox	17	Flue - SDA to PJFF
7	Duct - Tempering Air	18	PJFF
8	Duct - Primary Air to P.A Fan	19	Flue - PJFF to Fan
9	Duct - P.A. Fan to Pulv	20	ID Fan
10	Windbox	21	Flue - ID Fan to Stack Inlet
		22	Penthouse - Refractory roof

Table 2: List of equipment and equipment numbers corresponding with Figures 1-5

Figure 1: Schematic of equipment

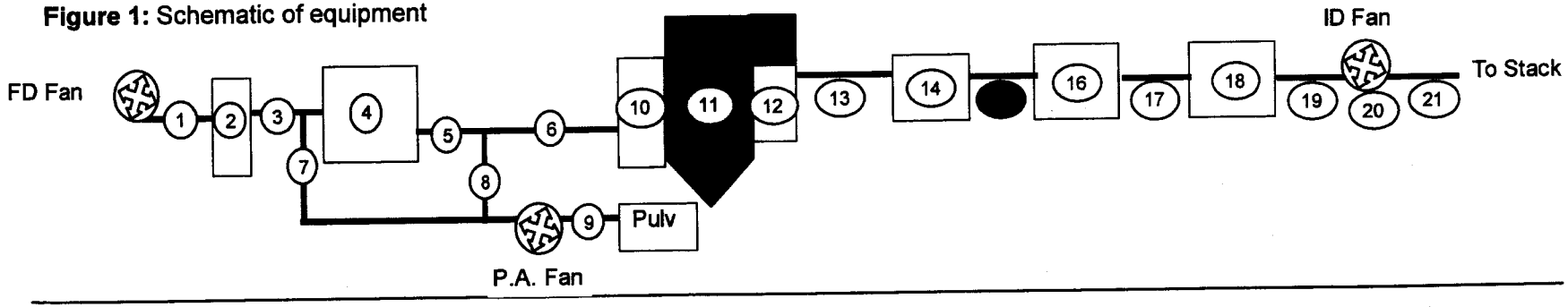


Figure 2: Continuous Design Pressure through main equipment

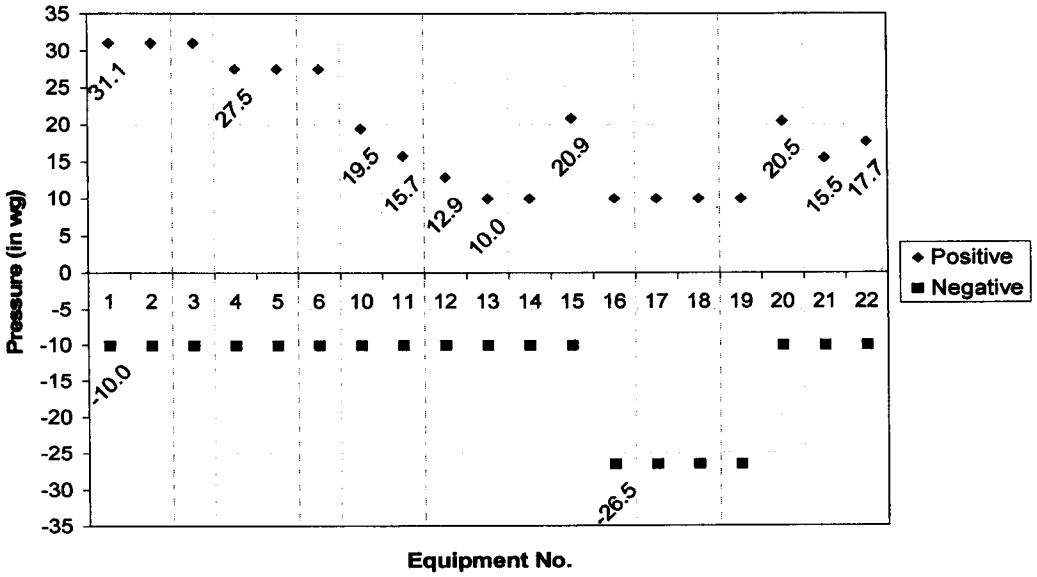


Figure 3: Transient Design Pressure through main equipment

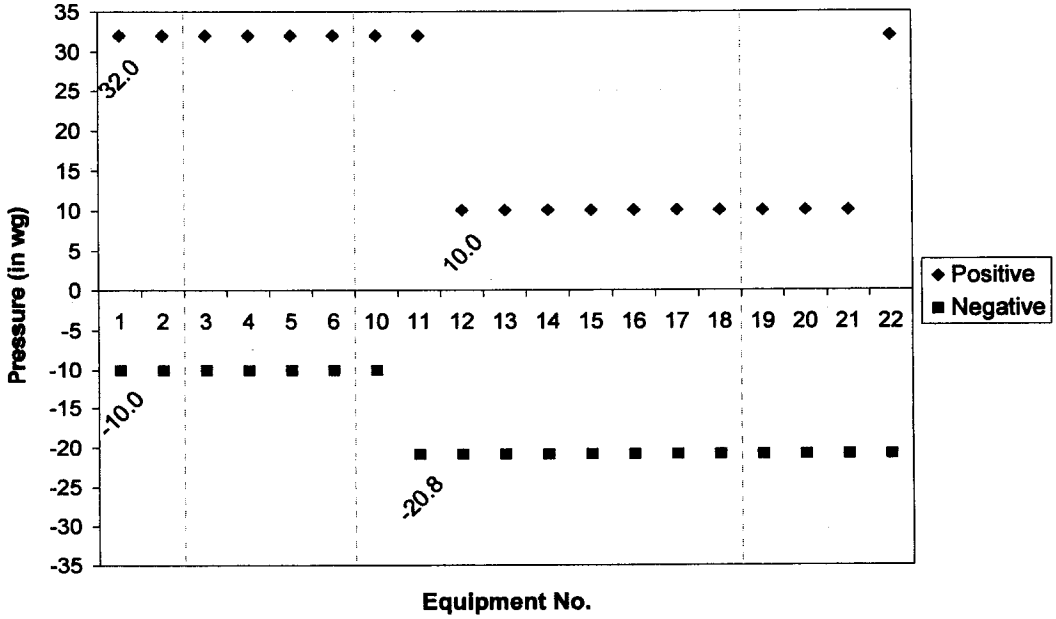


Figure 4: Continuous Design Pressure through pulverizer ducts

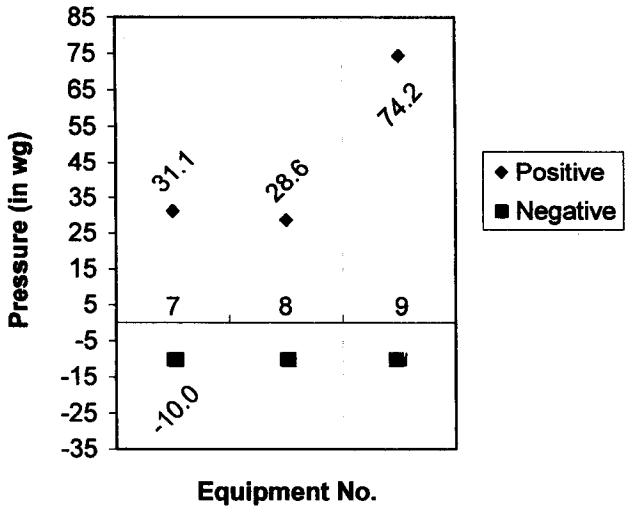
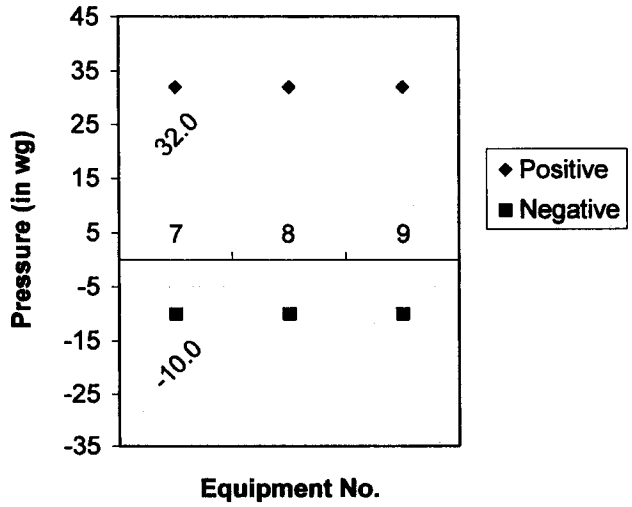


Figure 5: Transient Design Pressure through pulverizer ducts



Final Job Report

To analyze the structural integrity of the existing boiler in order to convert the unit to balanced draft operation and satisfy NFPA requirements

for

City of Rochester Public Utilities
Silver Lake Unit #4

B&W Contract No: S-10209

Submitted by

The Babcock & Wilcox Company
Generating Powerful Solutions℠
a McDermott company

September 28, 2007

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Pressure Study for City of Rochester Public Utilities

Silver Lake Unit #4
Rochester, MN

BACKGROUND

The unit is a Stirling Power Boiler (SPB) built by B&W in the late 1960's. The boiler is a pressure fired unit designed to operate under positive pressure only. A new induced draft fan is being installed (by others) on the unit to convert it to balanced draft operation in preparation of new emissions reduction equipment being installed on the back end. B&W has conducted an engineering study to determine what modifications are required to specific components in order to allow it to operate safely under balanced draft conditions.

ANALYSIS

Under contract with Utility Engineering for The City of Rochester Public Utilities, The Babcock & Wilcox Company has performed the following tasks for S-10209.

1. Analysis of the structural integrity of existing components under the new design conditions.
2. Determination and definition of the structural modifications necessary to upgrade components to the new design conditions.
3. Explanation of the modifications required in the form of a final report.

	Original Design Pressure (inH2O)	Balanced Draft Operation	
		Sustained Pressure (inH2O)	Transient Pressure (inH2O)
FD Fan to AH	+31.1	+31.1/-10	+32/-10
Air Heater (Air Side)	+31.1	+27.5/-10	+32/-10
AH Outlet to Windbox	+28.6	27.5/-10	+32/-10
Tempering Air Duct	+31.1	+31.1/-10	+32/-10
PA Fan to Pulverizers	+74.2	+74.2/-10	+32/-10
Windbox	+28.6	+19.5/-10	+32/-10
Furnace & Convection Pass	+20.7	+15.7/-10	+32/-20.8
Penthouse	+20.7	+17.7/-10	+32/-20.8
Economizer	+18.2	+12.9/-10	+10/-20.8
Flues to AH	+15.2	+10/-10	+10/-20.8
Air Heater (Gas Side)	+5.9	+10/-10	+10/-20.8

Design temperatures were the same as those used in the OEM boiler contract S-10209.

SCOPE OF WORK

The mechanical and structural components to be reviewed are as follows:

1. Boiler Loads & Supports to Top Steel
2. Boiler Roof Supports
3. Buckstay System
   A. Furnace and Convection Pass Wall Tubes
   B. Buckstay Sizes
   C. Tie Bar Sizes & Standoff Spacing
   D. End Connections
4. Economizer Casing
5. Economizer Hopper
6. Windbox
   A. Wall Tubes
   B. Casing Stiffeners
   C. Internal Support Components
   D. Wrap-Around Windbox
   E. Duct from Wrap-Around Windbox to Windbox
7. Arch
8. Penthouse Casing
9. Furnace Floor Supports & Hopper Vestibule
10. Generating Bank Stiffeners
11. Boiler Gas Outlet

Components not included in the scope are as follows:

1. Flues downstream of economizer hopper outlet
2. Ljungstrom air heater
3. Secondary & primary air ductwork
4. Top steel not originally supplied by B&W
5. All controls or instrumentation

STUDY RESULTS

Boiler Loads to Top Steel

The boiler loads have been recalculated based on balanced draft operation. For the existing arrangement of support rods it was determined that no addition support rods will be required for the pressure change. The existing rods were checked for the new loads and determined that the only modifications that are required are to roof support rods. A sketch showing the new boiler loads is shown in Appendix 1 and the required roof support rod modifications are shown in Appendix 2.

The top steel was not included in B&W proposed scope of review since it was not originally supplied by B&W. This is per page two of the contract proposal, dated April 19, 2007.

Top of Boiler Roof Supports

The roof tubes were check for the worst uplift and down force pressure condition across the roof under balanced draft operation. Per B&W standards, the worst case pressure conditions were determined to be a transient pressure of +32 inH_2O (uplift) and -22.8 inH_2O (down force). Using these pressure conditions, along with the dead load of the roof, it was determined that the intervals between roof supports are not acceptable for balanced draft operation.

To obtain an acceptable spacing between roof supports, a new support was added to reduce the unsupported length of the roof tubes. This new support is a W8x31 and is located at 8.5 ft from the steam drum. The beam is loaded by the roof tubes and has its load taking out to the furnace sidewalls by end connections. The required roof support modifications are shown in Appendix 2.

The existing roof support was analyzed at this pressure and determined that the support channel would need compression flange stabilization under negative furnace pressure condition (down force acting on the support). The rods at the existing support were found to not be adequate for the worst case uplift condition. To account for this new compressive load in the rods, a pipe sleeve was added to each rod. The sleeve is added to decrease the actual stress of the support rod when it is under compression. Modifications required to the existing roof support are shown in Appendix 2.

Buckstay System

Furnace and Convection Pass Wall Tubes

The furnace and convection pass wall tubes have been analyzed for the new load conditions due to balanced draft operation. The new transient pressure is a significant increase over the original pressure and was determined to be the controlling design condition. The analysis indicated that the furnace and convection pass wall tubes are adequate for the existing buckstay spacing, except near the top of the front wall where a new buckstay was required at the existing tie bar elevation 1086'-3".

Buckstay Sizes

All existing buckstays have been evaluated for the new pressure loads due to balanced draft operation. The Buckstays were checked for both positive and negative pressure.

During positive pressure in the furnace, bending of the buckstay causes compression in the inner flange of the buckstay, which is attached to the tie bar at the wall tubes by standoff plates. This inner buckstay flange is stabilized against lateral torsional buckling, at regular intervals, by the tie bar standoffs. The buckstay size was determined to be adequate as is for positive pressure in the furnace.

However, when the pressure in the furnace is negative, bending of the buckstay results in compression in the outer, unsupported flange. During negative furnace pressure the outer compression flange at some buckstay elevations was found to not be adequate for balanced draft operation. To strengthen the outer flange for this operating condition, coverplates were added at required locations.

A table of required buckstay modifications is shown in Appendix 3.

Tie Bar Sizes and Standoff Spacing

Under positive pressure conditions, the tie bars are loaded uniformly by the wall tubes and supported at the buckstay standoffs. The axial load, which is applied to them through the end connections, adds a tension load in the tie bars. Under negative pressure conditions, the tie bar is loaded by the wall tubes that it is welded to and again supported by the buckstay standoffs. The axial load from the adjacent wall buckstay end reaction will now be a compressive load in the tie bar.

An analysis was done of the combined bending and axial loads and it was determined that at all buckstay elevations, the tie bars do not need to be replaced or resized as long as additional standoffs are added. These additional standoffs help in a combination of two ways. First, the reduction in unsupported length of the tie bar lowers its actual bending stress. Second, the additional standoffs decrease the unbraced length of the tie bar and brace's it against buckling due to the compressive axial load. This increases the allowable compressive stress of the tie bar. The need to add standoffs for each buckstay elevation is shown in Appendix 3.

End Connections

New end reactions have been determined based on balanced draft operation. The existing buckstay end connections use tie bar extensions to connect to the end connection links. Due to the negative transient pressure, it is now necessary to consider compression in these links and tie bar extensions.

It was determined that the existing end connections are adequate for balanced draft operation. The addition of an end connection is required at the front wall at buckstay elevation 1086'-3". This will be a B&W standard end connection.

Economizer Casing

The economizer casing was analyzed for the new pressure conditions and determined that modifications are required to strengthen the existing stiffeners. The casing was reviewed for the worst case pressure conditions of +12.9 inH_2O sustained and -20.8 inH_2O transient. Required modifications to the economizer casing stiffeners include: adding structural angles to existing stiffener bars, adding coverplates to the outer flange of the channel stiffeners, modifying the end connections of the channel stiffeners, and adding new pipe ties stabilizers. Modifications are shown in Appendix 4.

Economizer Hopper

The economizer hopper has been analyzed for the new pressure condition due to balanced draft operation and determined that modifications are required. The controlling design condition is when there is negative transient pressure in the hopper. To reinforce the existing stiffeners for this condition, the addition of structural angles to the existing stiffeners is recommended. These modifications are shown in Appendix 5.

Windbox

Wall Tubes

The wall tubes at the windbox have been evaluated for the differential pressure between the furnace and the windbox and determined that the worst case differential pressures across the tube wall in the windbox zone will be -29.5 inH_2O sustained and 32 inH_2O transient. The tubes have been analyzed for this differential pressure and results indicated that the tube wall is ok for the new pressure loads.

Casing

The windbox casing has been reviewed for the worst case conditions of -10 inH_2O sustained and 32 inH_2O transient and determined that the existing stiffener spacing is adequate for the new design pressures. The size of the existing stiffeners were also checked and determined insufficient for balanced draft operation. To increase the strength of the stiffener, structural angles are recommended to be added to the existing casing stiffener bars. At stiffener locations where there are space constraints, new angle stiffeners are being added between existing bar stiffeners. Casing modifications are shown in Appendix 6.

Internal Support Components

The internal support components of the windbox have been evaluated for the new design conditions and determined to be adequate as is. The review was comprised of all windbox internal supports including, but not limited to, the windbox truss members, weld attachments and internal pipe ties.

Wrap Around Windbox

The wrap around windbox has been reviewed for balanced draft operation and determined that the stiffener support spacing is adequate for all casing surfaces. The size of the existing stiffeners was also checked and found to be adequate as is on the side casing plate, but not adequate on the top and bottom casing plates. To increase the strength of the stiffeners on the top and bottom casing plates, the addition of structural angles to the bar stiffeners is recommended. This modification is shown in Appendix 6.

Also, as part of the review, the wrap-around windbox internal support components were checked for balanced draft operation and determined to be sufficient as is. The review of the internal support components included the pipe ties, connecting plate, and welds.

Duct from Wrap-Around Windbox to Windbox

The duct from the wrap around windbox to the windbox has been evaluated for the new design condition. The current casing stiffener spacing and internal pipe ties were found to be adequate as is. It was determined that reinforcement of the existing casing stiffener bars and channel stiffeners is required. To increase the strength of the stiffener bars the addition of structural angles to the stiffeners is recommended, and to increase the strength of the channel stiffener, the addition of coverplates to the outer flange is recommended.

Arch

The arch tubes have been analyzed for the new conditions due to balanced draft operation and were found to be supported at adequate intervals. The supports were then analyzed for the loading conditions and determined that the arch support does required reinforcing. The controlling design condition is when there is a negative transient pressure in the furnace. When this occurs the support tie is loaded by bending loads from the pressure acting on the arch tubes and by compression loads from the pressure acting on the furnace side wall. To reinforce the support for these loads a channel was added to the support. Modifications are shown in Appendix 7.

Penthouse Casing

The penthouse casing has been evaluated for a sustained pressure of +17.7/-10 inH_2O and a transient pressure of +32/-20.8 inH_2O and determined that modifications are required. Most of the existing casing stiffeners require the addition of structural angle members to increase the strength of the stiffener. Locations where structural angles are to be added are shown in Appendix 8.

The stiffener spacing and channels were also reviewed and found to be sufficient for balanced draft operation as is.

Furnace Floor Supports & Hopper Vestibule

The furnace floor and support system were reviewed for balanced draft operation and determined that the floor tubes are supported at adequate intervals. The floor supports were also analyzed for balanced draft operation and determined that modifications are required. The modifications are required because an uplift condition now exists from the negative

pressure that is in the furnace. Since the support beam was not originally designed for uplift, modifications are required at the support beam ends to carry the load into the furnace sidewall. These modifications include the addition of bars and shear lugs to the end of each support. The support beam was also checked for the new down force pressure loads and was determined to be adequate as is. Modifications to the furnace floor supports are shown in Appendix 9.

The furnace hopper vestibule was checked for balanced draft operation and determined to be adequate as is. No modifications are required.

Generating Bank Stiffeners

The generating bank stiffeners were reviewed for balanced draft operation for the worst case operating conditions of +32/-20.8 inH_2O and determined that modifications are required. These modifications include adding structural angles to the existing stiffening bars for added strength. Locations where the modifications are required are shown in Appendix 10. The existing casing stiffeners spacing were also analyzed and determined to be adequate as is for the new design condition.

Boiler Gas Outlet

The boiler gas outlet was reviewed for balanced draft operation and determined that modifications are required to the existing casing stiffeners. It was determined that the existing stiffening bars on the rear and side walls require the addition of structural angles to reinforce the stiffeners for the pressure upgrade. The existing S5x10 beam that is located on the rear wall also requires reinforcement. To reinforce this beam, the addition of a coverplate is required to the outer flange. These modifications are shown in Appendix 10.

Also included in the study was a review of the existing stiffener spacing and pipe ties. These items were reviewed and determined to be adequate as is.

CONCLUSION

As has been outlined in the analysis results, in order to support the new pressure loads for balanced draft operation, modifications will be required to the Rochester Public Utilities Silver Lake Unit 4. A summary of the modifications is listed below and a modification summary sketch is shown in Appendix 11.

- Add coverplate to the outer flange at (11) buckstay elevations
- Additional buckstay standoffs will be added at each buckstay location.
- Add buckstay to the existing front wall tie bar at elevation 1086'-3"
- New end connections are required at the front wall at elevation 1086'-3"
- Existing stiffener bars on the windbox and wrap-around windbox must be reinforced with an angle
- Add coverplates to the outer flange of the existing channel stiffeners
- Shear lugs and bars must be added to the ends of the furnace floor support beam to account for uplift of the furnace floor.
- Change end connection of arch support and add a channel to the arch support
- Add new roof support with end connection
- Add compression flange stabilizers to the existing roof support and add compression sleeves to the existing roof support rods
- Existing stiffener bars on the penthouse casing must be reinforced
- Add coverplates to the existing channel stiffeners on the economizer casing and modify end connection. Also, add new pipe tie stabilizers
- Reinforce existing stiffener bars on the economizer casing, economizer hopper casing and generating bank stiffeners
- Add a coverplate to the outer flange of the existing S5x10 beam and reinforce existing stiffener bars on the boiler gas outlet

Appendices

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RESOLUTION

BE IT RESOLVED by the Public Utility Board of the City of Rochester, Minnesota, to approve a purchase order agreement with The Babcock & Wilcox Company for

Professional Services for the Supply of Graphics and Engineered Materials
As Defined in Proposal P-008561 for Modifications to SLP Unit 4
Emissions Reduction Project

The amount of the agreement to be ONE HUNDRED SEVENTY-EIGHT THOUSAND FOUR HUNDRED TWENTY AND 00/100 DOLLARS ($178,420.00).

Passed by the Public Utility Board of the City of Rochester, Minnesota, this 30th day of October, 2007.

_____
President

_____
Secretary