REPORT TO COUNCIL 15
City of Sacramento

915 I Street, Sacramento, CA 95814-2604
www.Cityof Sacramento.org

Consent
February 12, 2008

Honorable Mayor and
Members of the City Council

Title: Change Order: SRWTP 9.5 MG Reservoir Roof Replacement Project (ZH51, Z14001600)

Location/Council District: The project is located at the Sacramento River Water Treatment Plant (SRWTP). A location map is included as Attachment 1. The project is in Council District 1.

Recommendation: Adopt a **Resolution** 1) approving Change Order No. 1 to Contract No. 2007-215 with Madsen Roofing Company in the amount of $563,370 for the SRWTP 9.5 MG Reservoir Roof Replacement project (PN: ZH51).

Contact: David L. Brent, Engineering Services Manager, 808-1420

Presenters: Not Applicable

Department: Utilities

Division: Engineering Services

Organization No: 3332

Description/Analysis

Issue: The existing 9.5 MG reservoir at the Sacramento River Water Treatment Plant was constructed in 1936 and provides the treatment plant with potable drinking water storage. The existing roof was constructed of asbestos containing panels and the redwood decking underneath the roof has outlived its service life and needs to be replaced.

The original design by CYS Structural Engineers called for untreated plywood as the new roof deck material. During the removal of the existing roof deck, the Contractor called this design into question due to high moisture readings taken within the reservoir and stated that the untreated plywood would decay rapidly and was not suited for this application. The Contractor proposed the use of a fiberglass roof deck as an alternative to the plywood. The City's consultant design engineer, CYS Structural Engineers, has since concurred that untreated plywood would not withstand the constant humidity and agreed with the use of the fiberglass decking.

Policy Considerations: This action is in conformance with City Code Title 3, Chapter 3.60.210, which governs change orders.

Environmental Considerations: This project replaces an existing roof for a public utility water distribution structure and involves no expansion of capacity. It is therefore categorically exempt from CEQA (the California Environmental Quality Act) under Class 1, Section number 15301(b) and Class 2, Section number 15302(c) of the CEQA Guidelines. Projects exempt under Class 1, Section number 15301(b) consists of minor alteration or repair of existing facilities used to provide public utility services. Projects exempt under Class 2, Section number 15302(c) consist of replacement or reconstruction of existing utility systems and/or facilities involving negligible or no expansion of capacity.

Commission/Committee Action: None

Rationale for Recommendation The City proceeded with this construction contract in the belief that design provided by CYS Structural Engineers was viable. CYS has since concurred with the Contractor (Madsen Roofing) that the designed plywood roof diaphragm is not suitable for this application and that the fiberglass structural panels are the most cost effective alternative. This Change Order is necessary because the reservoir is an integral part of the water treatment plant and delays in construction could adversely affect the plant's operation during high water demand months. Staff is pursuing a financial remedy with CYS for recoverable costs associated with this Change Order.

Financial Considerations: The total budget for the project is $2,180,000. There are sufficient funds in the SRWTP 9.5 MG Reservoir Roof Replacement project (PN: ZH51, fund 413) to execute the change order and complete the project.

Emerging Small Business Development (ESBD): This project included a target participation goal of 20% for emerging and small business enterprises (ESBE's) as required by Ordinance 99-007 and Resolution 99-055, relating to ESBD participation goals and policies, adopted by the City Council on February 9, 1999. The responsive low bidder, Madsen Roofing Company, is a City certified SBE and exceeded the ESBE goal with a participation level of 100%.

Respectfully Submitted by: _____

David L. Brent
Engineering Services Manager

Approved by: _____
Gary A. Reents
Director of Utilities

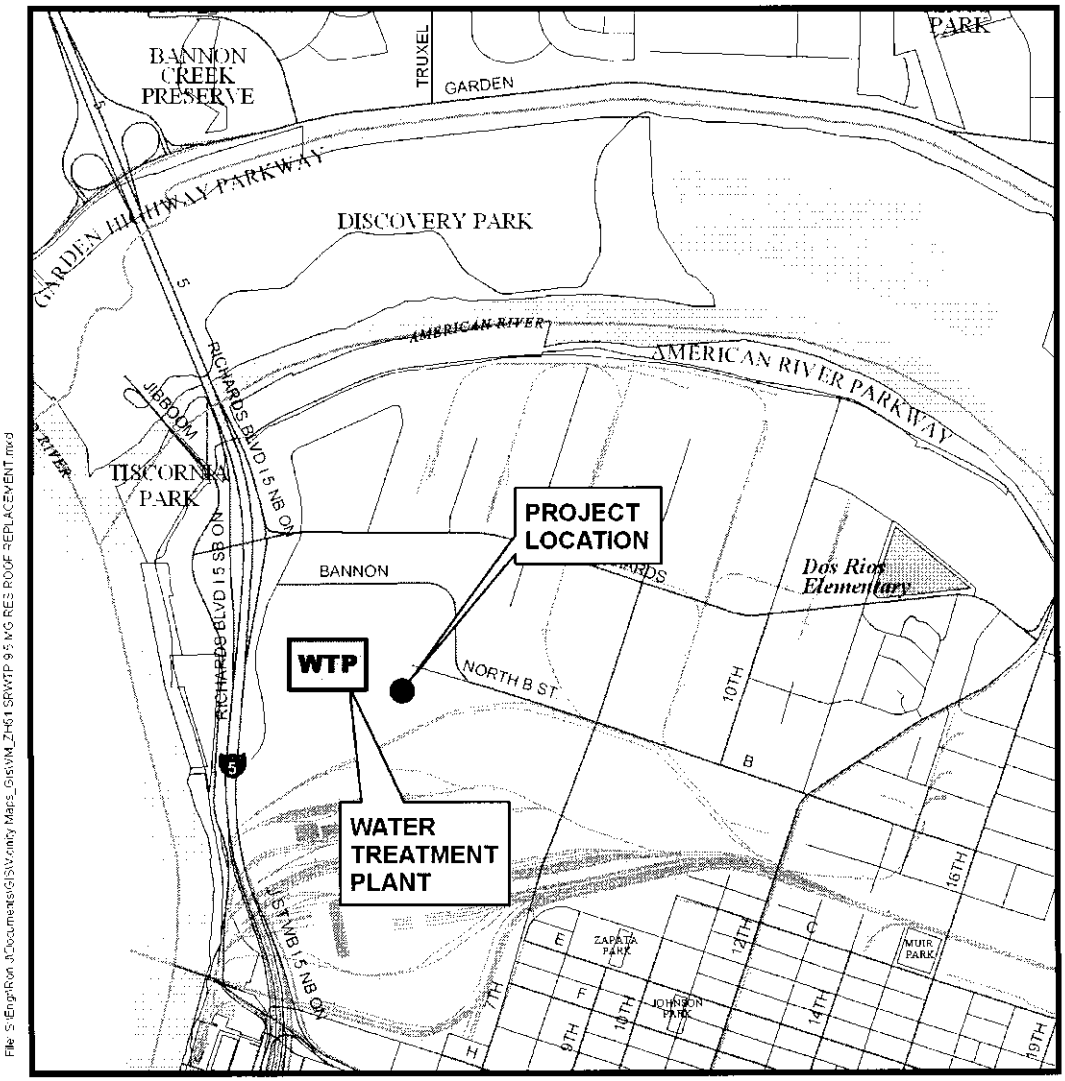
Recommendation Approved:

_____
for Ray Kerridge
City Manager

Table of Contents:

ATTACHMENT 1

SRWTP 9.5 MG RESERVOIR
ROOF REPLACEMENT
(PN: ZH51)



Map Prepared By
City of Sacramento
Department of Utilities

Attachment 2

BACKGROUND

The 9.5 MG reservoir at the Sacramento River Water Treatment Plant (SRWTP) provides storage for potable water at the treatment plant. The reservoir is a primary facility needed to meet the high water demands during the summer months. The roof was constructed in 1936 and consists of a timber-framed system. Due to the excessive amount of moisture constantly present inside of the reservoir, corrosion and rot has begun to weaken the structural integrity of the roof.

The Department of Utilities issued a "Request for Proposal" in June 2004 to perform a complete investigation of the roofing and framing system, concrete walls and columns, and to also investigate whether the reservoir was up to current seismic and structural standards. The scope of work also consisted of providing design services based on the findings of the inspection, including construction plans and specifications. CYS Structural Engineers, Inc. was awarded the contract and completed the inspection in April 2005.

The project objectives are based on the recommendations from the investigative report and are:

- Remove and replace the entire roof and redwood decking.
- Remove and replace all identified structural members in the roof framing that have suffered corrosion or rot.
- Repair all cracked or spalled areas in the concrete walls and columns and apply waterproofing to all concrete surfaces.
- Install additional straps at the connection between the walls and columns and the roofing system

This project was advertised and six (6) bids were received and opened on August 29, 2007. The low bidder was Madsen Roofing Company with a bid of $1,067,983, approximately $250,000 lower than the second low bid. The engineer's estimate was $1,650,000. The project design prepared by CYS Structural Engineers and included in the request for bids called for untreated plywood as the new roof deck material.

Construction began in October 2007 with the Contractor removing the existing roofing system. During the removal of the existing roof deck, the Contractor began to express concerns over placing untreated plywood as the roof deck due to the high moisture content of the reservoir's interior. The City rejected the use of plywood treated with wood preservatives due to the potential for chemicals to leach out of the plywood and affect water quality.

On December 7, 2007, City staff received a letter via certified mail from the Contractor (see Attachment 3) stating the Contractor's concerns over the plywood and included professional opinions from two of the country's leading wood experts. Their conclusions were: (1) the use of untreated plywood roof panels as called for in the original design is

inappropriate since short-term deck failure due to wood decay is virtually assured, and (2) the substitution of the proposed Resolite fiberglass reinforced decking for plywood decking, that includes a water-tight roofing membrane that is placed over the fiberglass deck, is the most appropriate and cost-effective solution given the moisture levels within the reservoir.

City staff forwarded the letter to the design engineers, CYS Structural Engineers, who agreed with the assessment of the letter and concurred with the recommendations to change to the fiberglass roof decking. City staff agrees with this recommendation.

Although the proposed substitution of the fiberglass reinforced panels will result in an increased cost to the project, the benefits of making the substitution include: (1) the City of Sacramento will receive a much more reliable and environment-appropriate application, that will not be compromised by the moisture levels within the tank, and (2) the proposed single-ply roofing system will provide the City with a 20-year, no dollar limit, manufacturer's warranty, a significant benefit not available with the current system. Further, even with the increased expense associated with this solution, the overall project cost is consistent with the original engineer's estimate and project budget range.

Due to the operational necessity of using the reservoir during high water demand periods, staff is recommending approval of the change order so that the Contractor can finish the work before the period of peak water demands. While staff believes that the cost included in the change order is reasonable, the City in all probability would have obtained a lower price for the fiberglass roof deck through competitive bidding if CYS Structural Engineers' original design had included the fiberglass roof deck rather than incorrectly specifying the use of untreated plywood. Correcting this design flaw after the contract has been awarded and work has begun, rather than prior to requesting bids, therefore likely has resulted in additional cost to the City. The City also has incurred additional project administrative costs due to the flawed original design. Staff intends to pursue cost recovery from CYS Structural Engineers for these additional costs.

Attachment 3

Madsen
ROOF COMPANY, INC.

December 7, 2007

VIA E-MAIL & CERTIFIED U. S. MAIL

Mr. Warren Peterson
City of Sacramento
1395 35th Avenue
Sacramento, CA 95822

Re: Use of Plywood Roof Panels
Sacramento River Water Treatment Plant
9.5 MG Reservoir Roof Replacement Project

Dear Warren:

The purpose of this letter is to reiterate the concerns that we have expressed to you over the past several weeks regarding the use of plywood roof panels with respect to the above-referenced project as called for in the current specification. As you are aware, we have devoted many hours of research and study to this issue, and have consulted appropriate experts. Our research has included taking the enclosed humidity and temperature readings at the project from October 30 through November 2, 2007 and November 5 through November 8, 2007 in order to determine the moisture content of the environment.

As indicated above, we have been working closely with experts in this field to ensure that we have a sound basis for our conclusions. Specifically, wood scientist Matthew Anderson of Wood Advisory Services, Inc. and technical director Jim Carlson of Building Envelope Technology & Research, have reviewed this matter. Both gentlemen are recognized, highly respected experts in their fields. They have participated in conference calls, reviewed photographs of the project and studied the humidity and temperature measurements referred to above.

Based on our research and the professional opinions of Mr. Anderson and Mr. Carlson, we have reached the following inescapable conclusions: (1) the use of untreated plywood roof panels as called for in the current specification is inappropriate since short-term deck failure is virtually assured, and (2) the substitution of the proposed Resolite 12 oz. Roof Deck Type 1240 fiberglass reinforced decking for plywood decking is the

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www.madsenroof.com

appropriate solution given the moisture levels within the reservoir. Both Mr. Anderson and Mr. Carlson fully support these conclusions as indicated in Mr. Anderson's December 6, 2007 correspondence, a copy of which is enclosed with letter.

While we realize that the proposed substitution of the fiberglass reinforced panels will result in an increased cost to the City of Sacramento, we strongly urge this course of action. We note that (1) even with the increased expense associated with this solution, the overall project cost is consistent with the original budget range, (2) the City of Sacramento will receive a much more reliable and environment-appropriate application, and (3) the proposed single-ply roofing system will provide the City with a 20-year manufacturer's warranty, a significant benefit not available with the current system.

While we are hopeful that the City of Sacramento will concur with our conclusions, please be advised that, should the City choose to proceed with the current specification, it will be doing so over our strong objections. Accordingly, Madsen Roof Company cannot be held responsible for pre-mature failure of the roof associated with this decision.

We will await your instructions regarding this matter.

Very truly yours,

MADSEN ROOF COMPANY, INC.

Christian Madsen

enclosure
cc: Robert Spalik (by e-mail)

Wood Advisory Services, Inc.
3700 Route 44, Suite 102 • PO Box 1322
Millbrook, New York 12545
Phone (845) 677-3091
Fax (845) 677-6547

December 6, 2007

Mr. Christian Madsen
Madsen Roof Company, Inc.
P.O. Box 277730
Sacramento, CA 95827

Re: Sacramento River Water Treatment Plant

Dear Mr. Madsen:

Wood Advisory Services, Inc. has been retained by the Madsen Roof Company to provide consultation regarding the potential use of plywood in the newly proposed roof system above the potable water reservoir located at the Sacramento River Water Treatment Plant. On October 29, 2007 WAS, Inc. participated in a conference call with the Madsen Roof Company and Building Envelope Technology & Research regarding the use of a fiberglass reinforced roof panel instead of the currently proposed plywood roof panels.

At the time of our conference call I expressed serious concern with respect to the use of plywood panels. First of all, I suspected that elevated relative humidity levels were likely present below the roof system and it was my understanding that a significant amount of condensation occurs in the roof system. Subsequent to our conference call I also had the opportunity to review some photographs of the current roof system including the redwood beams/stringers and the wood roof deck planks. My professional opinions based on my conversations and review of photographs at that time were as follows:

1. It is my understanding that selected redwood beams/stringers, which are original construction materials have already been marked for replacement due to the presence of decay. Additionally, I understand that there are numerous wood roofing planks that are decayed. Based on our conversations the decay in the beams/stringers and wood planks was the result of roof leaks. Additionally, I suspected that condensation was also associated with the observed decay.

2. The only feasible plywood materials that could hypothetically be used in this type of high moisture level environment, directly above 9.5 million gallons of held water would be plywood manufactured with a decay resistant species, such as redwood or cedar, or plywood that had been treated with a wood preservative. However, I am aware that preservative treated plywood would not be acceptable since leaching of the preservative can be expected

to occur above a potable source of water. As a wood scientist, it is my professional opinion that the use of untreated plywood is not acceptable either, because in a high moisture level environment the untreated plywood would be susceptible to rapid wood decay as a result of condensation and elevated relative humidity levels. Therefore, the only feasible materials that could be used as the roof deck in the new roof system deck panels would be the proposed fiberglass reinforced panels or if plywood is, for some reason, mandated for use then the plywood must be manufactured with a decay resistant species.

Since the time of our conference call it has been brought to my attention that the relative humidity levels in the water tank, with only 1 inch of water, were document from October 30 through November 2, 2007 and November 5 through November 8, 2007. The document levels inside the tank and below the roof system ranged from 79% to 88%. The documented temperature levels ranged from approximately 58°F to 70°F. The corresponding wood moisture content levels for these environmental conditions can be acquired from a psychometric chart, but I used Table 3-4 in the Wood Handbook, Wood Used as an Engineering Material. The wood moisture content levels for the documented conditions would range from approximately 16.2% to 21%. A wood moisture content level of approximately 20% is required for the growth of wood decay, which would be readily feasible in the roof materials based on the conditions documented. The data also confirms that the environment inside the tank is subject to elevated moisture conditions. Additionally, condensation inside the tank has already been documented. Based on the data it would be reasonable to expect frequent condensation inside the tank and under the roof deck, and potentially within the roof system throughout the year. Therefore, any wood roofing material is going to be susceptible to wood decay unless it is a decay resistant species or preservative treated.

Based on my conversation with the Madsen Roof Company and with BET&R technical director Jim Carlson, and the documented relative humidity levels by the Madsen Roof Company, my opinions as stated remain unchanged, and they have been factually supported in-situ by the data provided.

Sincerely,

Wood Advisory Services, Inc.

M.E. Anderson, M.S.
Wood Scientist

MEA:kr Madsen.1205L.wpd

BUILDING ENVELOPE TECHNOLOGY & RESEARCH

PROFESSIONAL ROOFING, WATERPROOFING, AND CLADDING CONSULTANTS

Sacramento Water Tank Reroofing Project

	10/30/07			10/31/07			11/1/07			11/2/07			11/3/07		
Ambient Outside:	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm
Temperature:		59.6	70.6	54.5	62.5	78.7	53.5	63.7	79.8	51.3	66.2	77.3			
• Bottom															
• Mid-Level															
• Under Roof Deck															
Humidity:		65%	23%	87%	64%	0	83%	60%	0	78%	51%	0			
• Bottom															
• Mid-Level															
• Under Roof Deck															
Inside Tank:	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm
Temperature:															
• Bottom		60.3	61.6	58.7	59.9	61.7	57.6	59.6	61.4	56.3	59.2	61.6			
• Mid-Level	59.9	60.5	62.8	59	60.5	63	57.6	60.7	63.2	56.5	59.9	63.5			
• Under Roof Deck	58.3	63.4	68.0	58.5	62.3	69.1	56.9	63.4	69.3	54.4	63.4	69.7			
Humidity:															
• Bottom		84%	83%	87%	86%	86%	87%	86%	86%	86%	86%	86%			
• Mid-Level	79%	79%	79%	86%	86%	85%	87%	86%	85%	86%	86%	83%			
• Under Roof Deck	79%	83%	79%	85%	87%	83%	87%	88%	77%	87%	87%	68%			

Temperature and Humidity Matrix

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BUILDING ENVELOPE TECHNOLOGY & RESEARCH
PROFESSIONAL ROOFING, WATERPROOFING, AND CLADDING CONSULTANTS

Sacramento Water Tank Reroofing Project

	11/5/07			11/6/07			11/7/07			11/8/07					
Ambient Outside	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm
Temperature:	54.2	79.6	82.3	52.2	77.9	84.1	52.7	70							
• Bottom															
• Mid-Level															
• Under Roof Deck															
Humidity:	63%	0%	0%	69%	20%	0%	69%	0%							
• Bottom															
• Mid-Level															
• Under Roof Deck															
Inside Tank	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm	8:00am	Noon	3:30pm
Temperature:															
• Bottom	54.9	58.5	60.7	54.9	58.1	60.3	55.3	58.1	60.5	56.2	58.5	59.9			
• Mid-Level	55.4	60.1	62	55.1	59.0	62.1	55.6	59.2	62.6	56.3	59.6	61.4			
• Under Roof Deck	53.3	65.3	69.3	52.7	62.8	68.6	53.5	64.3	69.5	54.9	62.1	67.0			
Humidity:															
• Bottom	83%	84%	86%	86%	86%	86%	87%	86%	87%	86%	87%	86%			
• Mid-Level	85%	85%	81%	85%	86%	84%	86%	87%	84%	86%	83%	79%			
• Under Roof Deck	86%	75%	70%	86%	82%	82%	87%	84%	75%	86%	85%	87%			

Temperature and Humidity Matrix

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Attachment 4

RESOLUTION NO.

Adopted by the Sacramento City Council

**APPROVE CHANGE ORDER NO. 1
FOR THE SRWTP 9.5 MG RESERVOIR ROOF REPLACEMENT PROJECT
(PN: ZH51, Z14001600)**

BACKGROUND

A. The existing reservoir roofing system for the 9.5 MG reservoir at the Sacramento River Water Treatment Plant is deteriorated and at the end of its useful life. In order to improve reliability, health, and safety, City Council approved the SRWTP Reservoir Roof Replacement Project (ZH51) budget in fiscal year 2004/2005.

B. CYS Structural Engineers prepared a set of plans and specifications to replace the existing roofing system and to retrofit the reservoir to current seismic standards. The project was advertised for bidding, and bids were received on August 29th, 2007 from six responsive bidders. Madsen Roofing Company was the lowest responsible bidder at $1,067,983 and was awarded the contract on September 18, 2007.

C. It has been determined that the use of untreated plywood for the new roof deck material, as specified in the project design, is inappropriate, and that a fiberglass roof deck, including a water-tight roofing membrane that is placed over the fiberglass deck, is the best suited and most economical material for this application.

D. Change Order No. 1 changes the roof deck material from untreated plywood to the new roofing system, for a net increase of $596,370.

BASED ON THE FACTS SET FORTH IN THE BACKGROUND, THE CITY COUNCIL RESOLVES AS FOLLOWS:

Section 1. The City Manager is authorized to execute Change Order No. 1 with Madsen Roofing Company for the Sacramento Water Treatment Plant 9.5 MG Reservoir Roof Replacement Project (ZH51), for the amount of $596,370.00.