SIA Grant Application Narrative/Budget/List of Support Materials

1. **Documentation of need for the project: What is the proposed project's significance to industrial heritage?**

   The 1918 Quincy Mine Hoist House is a significant structure within the Quincy Mine National Historic landmark District as well as the Keweenaw National Historical Park. The continued access to the building is extremely important to tell the story of the mining history of Michigan's Copper Country. The building houses the largest steam hoist in the world which was operated continuously from 1918 until 1933 at one of the deepest (9300 feet) and richest copper ore bodies in the Western Hemisphere. The steam hoist restoration was paid for by the Nordberg Company in the 1960s.

   The QMHA conducts tours of the building during the summer tourist season. The past year there were 14311 ticketed visitors to the Hoist House and a total of 30286 visitors to the site. The Quincy Mine site is one of the major attractions and is the most popular of the 19 Heritage sites affiliated with the Keweenaw National Historical Park, which was established by Congress in 1992 to tell the story of the national significance of Michigan's Keweenaw Peninsula Copper Mining Industry.

2. **What research methods will you employ?**

   An initial review of the structure indicates that the principal deterioration mechanism responsible for frame decay (spaulding damage) is carbonation induced corrosion of embedded rebar. A secondary deterioration mechanism effecting the building's exterior components is freeze/thaw deterioration of the cement paste. Lesser forms of deterioration were also observed consisting of: cracking, leaking and leaching. These conditions are considered secondary effects caused by the stated deterioration mechanisms and are recognized during restoration period development.

   The carbonation induced corrosion occurs when the normal alkalinity of the concrete is reduced by: moisture, temperature and humidity effects. Concrete normally protects rebars because of the high alkalinity. When alkalinity is lowered below a pH of approximately 11 the passive film surrounding rebar during fabrication, commonly called mill scale, is destroyed and the bar starts to rust. The loss of alkalinity is effected by surface environment, in this case high humidity or steam. Complicated by the on-insulated nature of the structure that no doubt produced intense sweating during the winter months. The process is also influenced heavily by the quality of concrete, with highly porous concrete being more susceptible. It is appropriate to note that the quality of concrete in early vintage structures such as the Hoist House was highly variable. Normal operating conditions within the structure permitted non stop harsh exposure and bleeding of the structures alkalinity. Once this process is initiated it continues unabated. Once initiated, the rusting process cracks the concrete and causes multiple lamination’s and surface spauling and eventual rebar displacement. So effected structural elements eventually become over stressed by either concrete or bar section reductions and failure occurs. It is believed this mechanism is responsible for most of the observed Hoist House damage, deterioration and distress.

   The freezing and thawing damage is a secondary mechanism and plays a lesser role than the

visible damage of corrosion spauling noted above. It can be just as destructive by reducing bond integrity between the concrete and rebar area not effected by corrosion. Basic working stress design principals require that the basis for analysis and strength development is bond between reinforcing steel and the surrounding concrete. Once this bond is impaired the limits of the design theory are breached and the structural element in question no longer behaves as intended. Analytical procedures must recognize this condition in order to produce a meaningful result during the structural evaluation process.

Effective concrete repairs are performed when the damaged and unsound concrete is removed, the rusting reinforcing steel is replaced or supplemented and properly anchored and new concrete is installed that bonds effectively to the parent structure. The structural integrity will be maintained by appropriate shoring and bracing as needed before any repair processes are undertaken.

The longevity of the repair is governed by protection effects and reducing harsh exposure after the concrete and re-steel is done. This includes proper waterproofing, special surface treatments and supplementing the replacement concrete mix design with enhancers or additives that compensate for and alter the historic corrosive environment.

The quality of the concrete restoration program is governed by the extent of removing the bad concrete, preparing the bonding surface to accept the new concrete, supplementing and anchoring the the damaged reinforcing steel, selecting the proper repair concrete design and installing the new concrete so that the repair material bonds properly to the parent structure thereby lost monolithic interaction.

The engineering tasks necessary to accomplish the above include defining a work scope, preparing design documents, bidding the project to contractors and coordination between the QMHA, the Keweenaw National Historical Park staff, the bidding contractors and suppliers. This process is anticipated to take three months.

3.Who is responsible for your project.

The QMHA as owner is responsible for the project and George Kiiskila, P.E. a member of the QMHA Board of Directors will be the person assigned to over see the project on behalf of the owner. The Project Engineer will be Bob Tracy, P.E. of Source Restoration Engineering Inc. John Rosemurgy, Architect and staff member of the Keweenaw National Historical Park will provide technical assistance. Resumes for these three persons are included with “Support Material”.

4. What tangible products do you expect to produce with this project?

Engineering documents prepared for bidding purposes will be created and will consist of photographs, design documents, construction plans and specifications and contract documents. The documents will be provided to the SIA, QMHA, the Keweenaw National Historical Park, the State Historic Preservation Officer, the Michigan Tech Archives and will be available to the bidding contractors and suppliers as will as USDA Rural Development the Federal agency who will be asked to provide the loan funds to implement the project which is estimated to have a $200,000 construction cost.

Budget

Expenditures		
Task 1. Final Project Scope	30 hours @ $100/hour	$3000
Task 2. Design Documents	32 hours @ $100/hour	$3200
Task 3. Bidding	20 hours @ $100/hour	$2000
Task 4. Coordination	23.5 hrs @ 100/hour	$2350
Expenses		$1750
Total Budget		$12250

Source of Funds	
SIA Grant	$3000
QMHA	$9250
Total Funds	$12250

List of Support Materials

Attached as separate PDF documents

- Keweenaw National Historical Park letter of support
- PDF " JS Request 4 Info"
  - Restoration Case Studies 15 pages (Note: Case Studies 3, 4 & 6 are most pertinent)
  - Bob Tracy P.E. Resume & List of Project Experience 4 pages
  - Project Engineering Budget 1 page
- John Rosemurgy Architect Resume
- George Kiiskila P.E. Resume