

**Zeitschrift:** IABSE reports = Rapports AIPC = IVBH Berichte  
**Band:** 39 (1982)  
  
**Artikel:** Designing bridge rehabilitations without "going under" (financially)  
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**DOI:** <https://doi.org/10.5169/seals-30184>

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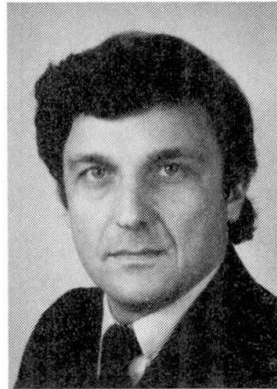
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## Designing Bridge Rehabilitations without „Going Under“ (Financially)

Projets économiques de réparation de ponts

Planung von Brückeninstandstellungen „ohne unterzugehen“ (finanziell)

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### SUMMARY

This discussion presents some practical steps and measures to be taken during all phases of small bridge rehabilitation projects with the purpose of avoiding budget overruns. The stages considered are the conception of scope of work, the field inspection, ratings, design and preparation of construction documents.

### RESUME

La contribution présente quelques dispositions et mesures à prendre dans toutes les phases de projet de réparation pour des petits ponts, dans le but d'éviter des dépassements de budget. Les étapes considérées sont la conception du travail à entreprendre, l'inspection in-situ, le diagnostic, le projet et la préparation des plans et documents.

### ZUSAMMENFASSUNG

Der Beitrag stellt einige praktische Schritte und Massnahmen vor, die in allen Phasen von kleineren Brückeninstandstellungs-Projekten, mit dem Ziel keine Kostenüberschreitungen im Budget zu erhalten, unternommen werden. Es werden die Stufen des Erfassens des Umfanges der Arbeit, die Bestandesaufnahme in situ, die Beurteilung und die Vorbereitung der Planunterlagen behandelt.



There is a sequence of steps one takes when undertaking a bridge rehabilitation project: An initial visit to the site, preparation of proposal/scope, in depth field inspection, report, preliminary design, final design, and finally, specifications and preparation of construction documents. In many design firms, where there is a certain specialization of the personnel, all above stages of work are assigned to different persons. In general, the first client contact and preparation of proposals is done by senior members of the firm, the field inspection is performed by an experienced field inspection team and the design is done under the supervision of a design project engineer. Many times, specifications and quantities are prepared by a specification writer. While this approach proves efficient in dealing with large projects, it can result in some overdoing and eventually to financial overruns when applied to small, tight schedule and modestly budgeted projects. A somewhat different approach to this type of project is highlighted in the following discussion:

The central figure in the performance of a small rehabilitation project is the Project Manager who in addition to being a talented engineer has to be well aware of the financial end of running a project. He has to be in constant alert toward the quality of the job while keeping a watchful eye on the dwindling budget assigned to the project. This Project Manager has to handle the project from the initial phase including the fee proposal through the inspection and the design, until the delivery of the final documents on time and within budget. The following are central points one should consider in order to successfully undertake a bridge rehabilitation project.

#### 1. THE INITIAL PHASE

(Client contact, scope, proposal.)

Many times a project will fail because of poor preparation of this first stage. The focal point in the initial stage is to understand the client's needs and his perception of the project. It is reasonable to assume that the client has a long time familiarity with the bridge to be rehabilitated, and that he has his own ideas about possible outcomes and solutions to the problems. During this phase the engineer has to understand its client expectations. It will be advisable to obtain copies of similar completed projects in order to estimate the client's need for details, clarity or use of materials and resources. The client's



standard specifications used in it's projects are another must for establishing the amount of work needed. The proposal, as part of a contract, is an agreement between the parts regarding the amount of work needed to accomplish the project. Extra work claims may easily be documented when based on a detailed proposal. The proposal has to cover following items:

- Detailed description of tasks with projected, manhours
- Duration of the inspection period including cost of subcontractors, equipment, cars, insurances and size of inspection team
- Detailed list of drawings with projected manhours
- Anticipated deadlines and assumption of review periods
- Any other mutual understanding regarding the scope of rehabilitation

This type of detailed scope of work will be easily turned into an extra work claim if, for example, the rehabilitation is more comprehensive than anticipated or when additional work is needed. While the engineer is allways eager to start a new project he should be well aware of the consequences of a poorly prepared proposal. He should allways strive to prepare a detailed well documented proposal

## 2. THE ORGANIZATION PHASE

It often happens that a team is assigned to start work on a project project on the official start-up date making it almost impossible for the project manager to really manage the job. In order to make use of his personnel, he will assign duties that may not be very important but will keep his people busy. He will continuously leap from person to person and from task to task, thus instead of him managing the project the project is managing him.

The right approach will be for the Project Manager to prepare the job in advance. He will obtain all existing drawings and records, he will visit the site for ascertaining access to all areas, he will line up subcontractors to set up scaffolding or to remove certain members or encasements, he will organize rental equipment such as cars, trucks, snoopers, generators and he will obtain insurances and permits. It is very embarrassing to show up at the site with the inspection team and the equipment to discover that a special entry permit to the Railroad property under the bridge is required. The financial loss of such a day is devastating. Since the costs of equipment are generally higher than the manhour costs, it is important to instruct in advance the members of the inspection team regarding their tasks. During this organization stage, the project manager will prepare a form of progress report which will indicate on a weekly basis the percent of completion versus the budget spent as well as projections for future progress and expenditures. A project well organized during this phase will definitely be performed on time and within budget.



### 3. THE PROJECT EXECUTION PHASE.

This stage covers the field inspection, the report, the rating and the design with respective intermediate approvals by the client. All these apparent separate tasks are strongly interlocked and interdependent. During this stage the individual talent of the Project Manager will bring the project to a successful completion or will plunge it into an unsurmountable tangle of details and clutter. The following is a nutshell description of short cuts and advise to the project manager of the small bridge rehabilitation project:

- Preliminary rating of typical members should be prepared prior to inspection; it may reveal that new bridge capacity requires stringers or floorbeams be replaced disregarding their physical condition. This may save considerable inspection time when observed in advance.
- Obsolete bearings or joints shouldn't be inspected, measured and evaluated when their replacement was decided in advance.
- A great part of the report can be recorded on tape in the field in the same order it will appear in the final report thus overcoming the "writer's block" that occurs while sitting in front of a bunch of photographs and notes.
- It is good to use the draftsmen in the inspection team and let them prepare good sketches to be transformed into drawings. For example, spalled areas on abutments and concrete piers.
- Deficiencies should be evaluated during inspection and a method of repair established. It makes sense to assign location of possible new members during the inspection thus avoiding a new site trip during the design phase.
- Evaluation of the accurate overlay thickness prior to commencement of calculations is very important in order to avoid recomputing.
- The inspection team is generally reluctant to do some physical tasks. It is better to hire contractors to install scaffolding, to move platforms, to remove concrete encasement or to drill cores.
- Not always can savings be obtained by operating machinery like snoopers or bucket trucks by the inspection staff. Many times this equipment becomes incapacitated and the lack of a trained operator can delay the whole inspection team.
- New details shouldn't be developed when the client is successfully using his own standards. It will be unproductive and time consuming.



- Incorporation of standard sheets should be encouraged as much as possible.
- One should concentrate on eliminating unnecessary details and over detailing. Each one has to be drafted, checked, reviewed and corrected.
- The Project Manager should study the typical contract documents. If a contractor has to supply shop drawings there isn't need for duplication. Many times the contractor can prepare it's own concrete reinforcing bar lists thus saving an enormous amounts of work from the engineer.
- The use of computers in a small project may turn into a continuous money drain and into a time killer, especially when using outside computer services. There are still engineers who can do moment distributions and influence lines by hand.
- Creation of new specifications should be avoided. The client has probably developed all that are necessary and they should be used. Any new ones have to be carefully tailored by the existing ones so as to obtain fast approval
- When dealing with a large bureaucratic client the format of the submission is of great importance samples should be obtained well in advance and followed to the letter.
- The Project Manager should refer to the original proposal handy and refer to it any time a request appears to be outside the original scope of work.

During the duration of the assignment, the Project Engineer will keep close control of the progress and the budget spent. When the project stops temporarily pending some approval, the project team should be assigned to other jobs so to avoid some feet dragging or slowed down production. It will be advisable to monitor the financial expenditures by assigning subcodes to the different tasks and by studying the breakdown of expenses at the end of the job. While this may increase the bookkeeping effort, it will furnish the engineer with some information to be used on future jobs.

In spite of all, no two projects are alike and no two project teams operate the same way. Eventually we will all learn from our mistakes and hopefully we won't pay too much for the learning.

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