



Internal Research Report – 2006/01

International Reconstruction Experience

Study tours to USA and Japan

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Resilient Organisations

The Resilient Organisations research programme aims to improve the resilience of New Zealand organisations to major hazard events. Organisations manage, maintain and operate our infrastructure, create our economy and contribute to our society. The ability of organisations to respond effectively following a hazard event will have a large influence on the length of time that essential services are unavailable, and ultimately how well our communities cope with major disaster.

Particular aspects of organisational response and recovery focused on by the research team include: how organisations plan for hazard events, their ability to direct resources effectively during crises, and the legal and contractual frameworks within which they will need to operate.

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Acknowledgement

I would like to thank all those people who took time to meet with me to share their knowledge of post-disaster reconstruction. In particular I acknowledge the invaluable support given by Mark Yashinski of CALTRANS, Sacramento, who organised my USA itinerary and also provided the key contacts in Japan.

1.0 Introduction

One of the activities under Objective 3 was to analyse contracts for reconstruction following natural disasters overseas, including how reconstruction contracts have been set up, the procurement mechanisms that have been used and the applicability of this international experience to New Zealand.

An opportunity came up to carry out some of this work whilst the author was based in the UK on study leave in 2005 and visits were made to USA and Japan en-route from UK to NZ. This report summarises information gathered from various meetings during these visits.

1.1 Brief

Contacts made in USA and Japan were emailed prior to meetings and asked to consider the following points in relation to their experience of reconstruction.

- How is reconstruction funded?
- How are legal and regulatory processes adapted to facilitate reconstruction?
- How do infrastructure owners and building owners engage the services of construction companies to carry out reconstruction?
- What types of contracts and payment mechanisms are most effective on reconstruction projects?
- How does the balance of time-cost-quality drivers shift during reconstruction projects?
- How is the switch from disaster response to disaster recovery defined?

2.0 USA

The USA was chosen as a suitable country for study for the following reasons:

- The local construction industry is similar to NZ in terms of types of client, contractor and consultant organizations and their relationships.
- There is recent experience of significant earthquakes in California, Washington and Alaska.
- USA has a well developed system for emergency management and response.

2.1 Visits made

Visits were made to owners and operators of major infrastructure networks. In all cases infrastructure had been damaged by earthquakes in recent years and had been repaired or rebuilt. Meetings focussed primarily on the logistical, contractual and regulatory processes in response and reconstruction activity and did not cover the social or community aspects of disasters.

The following table summarises the people visited.

Name	Position	Organisation
Martin Adams	Director of Operations	LA Water and Power
Leval Lund	Director - Retired	
Doug Failing	District 7 Director	CALTRANS
Raja Mitwasi	Chief Deputy Director	District 7
Robert Stott	Deputy Division Chief	CALTRANS
Mark Yashinsky	Seismic Design	Sacramento
Michael Sabbaghian	Senior Civil Engineer Disaster Assistance	California Office of Emergency Services
Doug Stanley	Supervisor of Structures and Contract Specification	Seattle DOT
Jerry Weigel	Chief Bridge Engineer	Washington State DOT
Elden Johnson	Design Chief	Alyeska Pipeline
Gary Tyndall	Design Group Chief	Alaska DOT
John Cusac	Maintenance Manager	
Donna Giordano	Construction Manager	

2.2 Context

The following section needs to be considered in the context of the people interviewed and the areas visited. The organisations visited in the USA are all large infrastructure owners and as serial construction clients have extensive experience in procurement of construction works. This experience is clearly to their advantage in a post-disaster situation as they have processes in place and have ongoing relationships with construction companies. They often have substantial in-house design and project management capability and have the opportunity to divert resources from existing contracts to emergency works. Larger clients may work together, for example Alyeska Pipeline helped with road reconstruction as they needed the roads to access their pipeline.

A second point is that each area visited has a history of dealing with major earthquakes. Therefore the organisations and people within these organisations have direct experience of dealing with the effects of earthquakes. Systems have often been developed and scenarios considered for when (rather than if) the next event occurs.

2.3 Opportunities resulting from disasters

For the infrastructure owners, earthquakes have provided opportunities in several ways.

- Opportunity to upgrade redundant / deteriorated facilities.
- Greater understanding over need for construction work from the public.
- Additional funding from external agencies (FEMA / FHWA).
- Relaxation of certain regulations and greater cooperation from regulatory authorities.

2.3.1 Replacement of damaged facilities

For large infrastructure owners, reconstruction is a constant process as infrastructure facilities are upgraded. Whilst a natural disaster event may shorten the design life, a damaged facility would have needed replacing anyway at some stage in the future. There is a degree of subjectivity over how normal deterioration overlaps with post-disaster reconstruction requirements and there is a tendency to attribute defects as earthquake related, even if it is not clear that they are. Thus a disaster can provide the opportunity to fast-track the upgrading of deteriorated infrastructure.

2.3.2 Legislation and regulations

Procurement processes and contracting arrangements for highway works under normal circumstances in the USA are restrictive and tortuous, which creates long lead times to the start of contracts. Procedures are tightly controlled and decision-making is not efficient. However, once a state of emergency is declared following a disaster, the focus changes to 'getting the job done' as efficiently as possible and the culture changes to one of cooperation. Following the Northridge earthquake, few routine project activities and components were waived, however recovery was facilitated by doing things differently. For example, the official emergency declaration allowed CALTRANS to advertise, bid and award reconstruction contracts in three days or less, with contracts awarded immediately following bid opening.

'Most routine activities were performed in a remarkably expedited manner, made possible by a sense of common mission, partnership, leadership, teamwork and an acceptance by CALTRANS, FHWA and industry of responsibility and accountability for the reconstruction work' (Northridge Recovery Task Force Report).

Following the Northridge earthquake, contractors found that CALTRANS answered questions related to bidding and construction issues in a much more responsive manner than on routine projects. Joint planning, communication and information-sharing by all involved parties in the office and in the field was a departure from routine projects, where the various processes and players tend to be less well integrated. Depending on an individual's point of view, some considered that those with authority removed some of the measures they would normally put in place to protect themselves, whilst another view suggested that decision-makers were at times unwilling to take responsibility.

2.3.3 Contracts

Contracting procedures used by CALTRANS following the Northridge earthquake were expedited in several ways, with different approaches used at different stages in the recovery process. The procurement approach was determined to a large extent according to the FHWA requirements, as follows:

(i) *Permanent repair and reconstruction work, not accomplished as **emergency** repairs, shall be done by the contract method unless the State Highway agency adequately demonstrates that some other method is more cost effective as described in 23 CFR 635.204. **Emergency** repair work may be accomplished by the contract, negotiated contract or highway agency force account methods as determined by the Highway agency as best suited to protect the public health and safety.*

(FHWA, Part 668, Emergency Relief Program <http://www.gpoaccess.gov/cfr/index.html>)

For the initial demolition, debris removal and shoring work, ‘force accounts’ were used whereby contractors were reimbursed all costs according to previously agreed rates plus agreed profit. In some cases these were carried out by contractors that were already working for the owner on other projects.

A procurement process referred to as the ‘Purple contract’ was based on the normal process but with reduced requirements for permits, public notice and full competitive bidding. This was used by CALTRANS for some of the early contracts and involved a small number of firms invited to bid for work, allowing contracts to be bid, awarded and approved within 2-3 days.

Under normal circumstances CALTRANS is not permitted to use design-build contracts. However, for reconstruction works use of design-build or ‘design-sequencing’ in place of design-bid-build, speeded up the follow on reconstruction works. (Design sequencing is a process where the design is progressed concurrently with construction.)

Another innovation used by CALTRANS was the “A+B contract” where 3-4 contractors were invited to provide a price for the works together with the number of days to complete. Each tender was evaluated based on the price (A) for carrying out the work plus the estimated cost (B) to CALTRANS for each day lost due to the facility being out of use; the contract was awarded to the contractor offering the lowest overall price (A+B).

It was considered important by both CALTRANS and the wider industry, to allow maximum competition and participation by all contractors by transitioning back as soon as possible to more open, competitive bidding and reasonable advertising times.

Bonuses which were paid to contractors as incentives for completing work early, provided added motivation to complete the reconstruction activities in minimum time. In order to obtain bonuses, contractors often worked around the clock, seven days a week. The large bonuses on offer showed that CALTRANS were serious about expediting the reconstruction work and gave contractors the incentive to take some financial risks and in some cases use more expensive methods, with potentially greater returns for finishing earlier. Penalties also provided contractors with incentives to ensure that short cuts were not taken and quality was maintained.

2.3.4 Funding

Following a disaster additional funding is available from Federal agencies – for highways FHWA provides funding, for other infrastructure FEMA provides funding. There are strict rules governing the eligibility for funding. The first 180 days following a disaster is considered the response stage and 100% Federal funding is available for work carried out during this time. (A particular issue arose in Alaska due to the timing of the Denali Fault earthquake. The event happened on 3 November 2002, at the beginning of winter. No major work could be carried out until after the thaw the following spring by which time the 180 day time limit had expired and Federal funding was therefore not available.)

Federal funding agencies are not willing to fund ‘betterment’ but will fund mitigation works as part of reconstruction and upgrades to comply with the latest codes of practice. Therefore the interpretation of

'betterment' can be subjective. This can lead to confusion and a tendency to only rebuild what was pre-existing to ensure funding is secured. There does not appear to be scope for the infrastructure owner to receive Federal funding up to an amount equal to the cost of restoring damaged infrastructure to the original condition and to choose to pay from their own funds the extra for 'betterment' - Federal funding is 'all or nothing'. One view was that FEMA funding was 'skimpy' and only covered patching up work.

2.3.5 Opportunity to act

The general environment pertaining to the period of recovery and reconstruction is one of collaboration and understanding. This period was found by those involved to last from 6 weeks up to 6 months and was followed by a gradual reversion to normal conditions. During this period there is generally an understanding of the need for construction work from the public and regulatory authorities. For example, the public will tolerate greater levels of disruption to the road network and greater levels of noise etc. if they see that this will facilitate the rate of reconstruction. Under these circumstances engineers have relative freedom to do the work as expeditiously as possible.

The public are most understanding whilst the response stage is underway. Once structures have been demolished it is important to keep the momentum going since the focus of the public may switch. For example following the Northridge earthquake there was a single-minded purpose in Los Angeles to get the highways up and running again. In contrast, following the Loma Prieta earthquake the local people of Oakland saw an opportunity to get rid of unsightly elevated highways and this focus delayed the restoration of the collapsed section of Interstate 880 until 1997; an eight-year delay. Santa Cruz spent 2 years debating what best to do following the earthquake; the delay to reconstruction work on damaged buildings blighted the area and this crippled local businesses. In contrast, Watsonville was reconstructed rapidly and the community recovered far more quickly as a result.

Generally buildings and infrastructure are rebuilt in their original locations. The layout of existing undamaged infrastructure, together with the difficulty of rearranging land ownership restricts the ability to change the layout of an existing urban environment.

2.4 Transition from response to recovery

The transition was defined in some cases by an engineering milestone or by a policy milestone. For example shoring up a bridge with timber to keep it open is response, with later demolition and reconstruction being recovery. LADWP considered that response ended once there was no longer a need to boil water for drinking. The 180 days limit for full FEMA / FHWA funding and streamlined permitting process, marks the end of response from their perspective.

2.5 Technical issues

‘As-built’ records have been helpful for repair of damaged structures. Also if reconstruction to original condition was required original design drawings were reused. Reductions in certain technical requirements have been used to speed up the recovery, for example shorter concrete curing time before removal of falsework.

Scenario planning by CALTRANS and LADWP has allowed critical infrastructure to be identified and plans for post-disaster recovery developed. Large infrastructure owners stockpile certain key materials that may be difficult to source or have a long lead time in readiness for a disaster, for example certain types of pipe and foundation piles. Also temporary Bailey bridges are kept in readiness by highway agencies.

Alternatively it may be necessary to assess the materials that are available following a disaster and then base designs on what is available. In Alaska where there is a shortage of plant, individuals such as farmers, with any useful items of plant were approached by the Department of Transportation and invited to work on recovery projects. There was a general understanding that no compromise was made on safety and the nature of the work in fact heightened safety awareness.

3.0 Japan

The visits made in Japan were generally more difficult to set up initially and required a few key introductions. However the people met were very helpful and took time to provide information relevant to the research.

Name	Position	Organisation
Dr. Toshio Iwasaki	President	Public Works Research Centre (PWRC)
Prof. Charles Scawthorn	Professor	Dept. of Urban Management Kyoto University
Dr Neil Britton	Team Leader International Disaster Reduction Strategies	Earthquake Disaster Mitigation Research Centre (EdM) National Research Institute for Earth Sciences & Disaster Prevention (NIED)
Mr Hide Kanaji	Principal Structural Engineer	Hanshin Expressway Public Corp

3.1 Features of the Japanese construction industry:

- Industry employs 6.7 million people.
- Over US\$700 billion is spent per year in construction (despite the current national economic recession).
- Industry is dominated by five large contractors.
- Clients are conservative in their procurement and contracting arrangements.

3.2 Contracts

Regulations controlling public spending under the Accounts Law require that competitive bidding* is used for routine construction work. However, there is provision in an emergency, when competitive bidding cannot be applied, for repairs to be accomplished by negotiated contract. Negotiated contracts are used for initial emergency works, where contractors submit a schedule of labour, plant and materials rates and owners estimate the cost based on agreed rates. There is a requirement to revert to competitive bidding* for reconstruction contracts, 3 months after the disaster.

Design and Build contracts are sometimes used for new structures but for post-disaster reconstruction a traditional design-bid-build process is used.

* It is widely known that the competitive bidding process used in the Japanese construction industry is a façade for a process known as ‘dango’. Under dango, the top construction firms in Japan meet regularly and discuss forthcoming contracts. They agree among themselves which of them is to win each of the contracts and for what price. For each project, each contractor will submit their bids accordingly to ensure that the agreed contractor is awarded the contract. Prices are obviously higher under this system than under true competitive bidding, but the process is allowed to continue because it ensures that there is sufficient money to employ large numbers of people in the sector, who may otherwise be unemployed.

3.3 Funding for post-disaster reconstruction

Natural disaster relief expenditure is addressed in the public funding ‘Accounts Law’. Funding is only available for public works; private owners need to obtain their own insurance. A public works authority may apply for the full cost of reconstruction to central government; the government decides the appropriate subsidy based on the cost of the work in relation to the annual turnover of the authority. The level of funding varies from between 2/3 to full cost of reconstruction, depending on the relative value of the work compared to the turnover of the authority.

3.4 Transition from response to recovery

The response stage covers emergency work, such as strengthening, shoring, making structures safe and demolishing unsafe structures. Recovery covers repair or rebuilding of damaged structures. The change from response to recovery is also represented by the change in procurement approach to competitive bidding 3 months after the event.

3.5 Time / cost / quality drivers

Under routine construction contracts, method specifications are used, with set unit prices. In contrast, for reconstruction projects contractors may be given freedom to use their preferred method and paid their costs plus an agreed profit.

4.0 Conclusion

The short visits to USA and Japan provided some insight into the way that each of these countries has dealt with recovery following major earthquakes. The relevance and transferability to New Zealand is debateable. Some of the issues that determine the relevance are as follows:

Both USA and Japan are larger than NZ by orders of magnitude, in terms of their populations and economic resources. As a proportion of their total population the number of people affected by recent large earthquakes in USA and Japan has been relatively small and the amount of resource available to recover relatively large. NZ in comparison has little 'redundancy' in terms of resources to deal with a major earthquake. This has been expressed by Leicester Steven as follows:

'Northridge was an island of desolation surrounded by a sea of resources, a major Wellington earthquake would be an island of desolation, period'.

Generally USA and Japan are more tightly regulated by government than NZ, and as a consequence are less innovative in their normal contracting arrangements. It is however interesting to note that in the USA, when there is less regulation following a disaster, clients are willing to use design and build - a more innovative, collaborative contracting arrangement. In contrast, in Japan design and build is sometimes used for routine work, but in a post-disaster situation only the traditional design-bid-build approach is used.

The organizations visited were large infrastructure (mainly highway) owners / operators, who have been described as 'serial clients'. Their experience will be relevant to some extent to large infrastructure owners in NZ, such as Transit, however there is a notable difference in that large infrastructure organizations in USA and Japan have a high level of in-house design expertise, whereas in NZ this is not the case. Thus, it would be expected that NZ clients would tend to use design and build contracts rather than carry out design themselves or through a designer. The experience of these large organizations will be even less relevant to smaller clients of reconstruction projects.