Acknowledgements

I wish to acknowledge the assistance of the following people in the preparation of this Individual Supervised Project:

Supervisor of the Individual Supervised Project.

Clyde Professor of Environmental Science at the University of Auckland, in his capacity as

Murray Mitchell and Martin Barnett of OPUS International Consultants, Christchurch Office, in their professional capacities of

Design Engineers on the Scott Base building programs.

Peter Broekman of Antarctica NZ of the recent building programs at Scott Base and in his capacity as Assistant Supervisor for this

Individual Supervised Project.

Presentation. The work is to be submitted by 31st March 1999 for assessment.

Terms of Reference

CON T 04 Supervised Project, as one of the four papers constituting the Graduate Certificate in Antarctic Studies, involves a
Commonwealth. Further New Zealand agreed to lay depots for the British Expedition on the Ross Sea side. The cost to
£ 50,000 to the expedition and the Ross Sea Committee was borne. This in effect was a commitment to the IGY and to the
1955 (February); British gave approval for a Trans Antarctica Expedition (TAE); in May the New Zealand Government promised
consid. 2. 1793 the New Zealand Antarctic Society made continuing submissions to the Ministry of External Affairs for the establishment of

a New Zealand station in the Ross Dependency, followed by letters to Prime Minister Sir Holland to ask for “very serious
discussions. Hence base would form important components of this network.

The idea of a third Polar Year (previously 1982 and 1992) to coincide with maximum sunlight activity evolved in 1990 in the USA at

1.2 Scott Base – the starting point

effect.

The analysis has involved, researching existing literature and documentary evidence, discussions with design consultants and

Evolution of Stability Criteria for buildings at Scott Base
Evolution of the Construction Technologies
Evolution of the Construction Techniques

This analysis focuses on the built environment in terms of the following themes:

Mechanical Systems

In 1957 to the present day sophisticated yet simple building designs incorporating technologically advanced structural and

The Built Environment at Scott Base. Antarctica has evolved over time from a series of fairly rudimentary shell-and-endures

1.1 The Analysis

Introduction
Contextualising the challenges of building at Scott Base, Antarctica

Selected from 65 applicants including Sir Edmund Hillary and Dr Trevor Hatherley as Scientific Leader.

New Zealand for this commitment was £400,000, which included the cost of a Base Station. Staff to operate the base were
3. Evolution of Construction Techniques

A consistent colour scheme, and the use of tongue-and-groove modular panels to give a sense of continuity. The visual impact though is

Architectural aesthetics have not been a consideration, to date, with the primary criteria being primarily concerned with maximising

Energy retention, minimising energy supply in terms of heating and cooling, weatherproofing the structure, ease of maintenance

When Frank Ponder (MWD) was assigned the task of designing the new base by the Ross Sea Commission in 1955, to coincide

3.1 The First Scott Base

significant environmentally.

and responding to the end use of the structure – whether a science laboratory or an athletics block. The buildings have maintained

energy retention, minimising energy supply in terms of heating and cooling, weatherproofing the structure, ease of maintenance

supply, hence in our instance, the decision to date, to specify metal encased polystyrene or polystyrene cladding panels.

Fire is the greatest threat and potential hazard at the base, with the associated requirement of controlling precious water

adhesives, and glues being unusable and plastic becoming brittle when

and cold temperatures contribute to certain

The steel components just stick the heat right out of your hands.

and cold temperatures, given that thermoplastics are rarely ever above zero. Hence

Zealand, personnel and the design consultants represent.

The regular deployment of experienced as labours, contracted services specialists, and supervision provided by Antarctica New

Costs for the overall project are always restrictive, given that it is funded by a government agency (Antarctica New Zealand), hence
This building was designed by the Ministry of Works Wellington, initially to house the Anster and Beaver planes. In fact, one of the buildings was designed by Sir Louis Eisler architect for the Ministry of Works Wellington. The building was intended to house the Anster and Beaver planes. In fact, one of the buildings was designed by Sir Louis Eisler architect for the Ministry of Works Wellington.
The buildings were now deliberately suspended a minimum of a metre off the ground to allow the wind and hence any snow to blow straight through underneath rather than settle and freeze.

Maintenance purposes.

1500lbs per bolt. The panels themselves had a hollow joint between them to facilitate independent removal, one from the other. For 12mm steel, 5½ inch bolts, which were deliberately spaced so they were not thermally conductive and had a shear strength of 1 ton. The panels were fixed to the walls, roof and floor frames using aluminium extrusions and panels fixed to the external face. These panels were fixed to the walls, roof and floor frames using aluminium extrusions and insulated inner floors were now incorporated by means of underfloor lagging and polystyrene foam and steel sandwich.

Ablutions, crèche and accommodation wing, 3½ acres.

The buildings were the Command block, 4, HQ (Command) Workshop, 6, and all additions to the Mess & accommodation wing, 3½ acres. The snow load of 1030 mm per year was allowed for assuming a snow density of 1.6 kg/m³.

A basic wind speed of 40 metres per second (140 mph) was used for the structure and 42 metres per second for the cladding. A
basic wind speed of 40 metres per second (140 mph) was used for the structure and 42 metres per second for the cladding.

In 1980 Works, Construction, (now Operations International) newly appointed design engineer designed the remaining buildings to a

3.3 Design and Construction

Late 1979 saw a pause in the construction programme as a result of the Eureka crash.

The team had to find alternative means of financing the project. The original programme was to build the main buildings and execute the first stage of the development at a cost of approximately $1 million. The programme saw the first steel framed buildings constructed at Scott Base with a 25 year life.

Buildings were designed by MOVD (Ministry of Works Development) (now to be Works Construction) for a lifespan of 25 years.

The design division, in order to increase the base by 50% capacity, so the DSR division was expanded very quickly.

In 1976 a complete reconstruction programme began, funded by the DSR (Department of Scientific and Industrial Research).

3.3 The 1976 - 1986 Building Programme

The steel frames were designed and continued to be the field equipment and storage facility.

canvas on steel girts and 100 x 50 nogs. This building was completely re-used in the late 80's with a proprietary lightweight steel
3.2 Energy

Warming of timber framing; steel studding however stays plump in such a low Rfh environment.

The relative humidity (Rfh) inside scott base ranges between 15-30% hence static electricity is a problem as the potential of techniques and there are automatically operated sprinkler heads in every area / space.

The fire resistance, was and is a critical issue at scott base hence the fire regulations that apply in New Zealand have been multiplied.

The dominant load at scott base is wind.

The designs did not have to be specifically earthquake safe, however, some of the timber was reinforced with steel frames and the depth of embedment (1 pn) of the frames was the exception given that the other timber was all timber joisted.

The breaking system consisted of steel rods lead through the frame to foundations and to ground (no guy ropes anymore).
4.2.4 Framing / Structure

4.1 Foundations

4 Evolution of Construction Technologies / Materials

New Zealand's incentivized building was constructed with non-combustible construction and operable windows being considered, with none of the building's wood framing. This led to the building having a high fire rating. The clear 7.6 cm thick floor slabs and beams were replaced with concrete slabs, which were then sheathed with metal sheathing. The building was completed in 1967 and is still in use today.

3.3.2 Waste

Sewage and grey water was treated and returned to the environment. The kitchen, both going through a mandatory process just sort of in the seas, before being discharged by a valve into the Ross Sea.
4.3 Claddings

Already stated.

Since Q + U steel studs have been used for the internal framing of structures, they stay plumb in the low RH environment as
4.5 Water Supply

The water supply to the base, RO1 and RO2, is service domestic facilities whilst the other is completely potable. 2,000,000 litres of seawater are converted to approximately 1,400 litres of potable water. However, this ratio is temperature sensitive.

- Ice makers provide the water needs of the base personnel until 1980.

4.6 Electrical

Static electricity inside the base is very dry being between 15 - 30%, which in turn creates an environment with high levels of static electricity. They are individually ventilated.

- Relief hatches inside the base are very dry being between 15 - 30%, which in turn creates an environment with high levels of static electricity. They are individually ventilated.

4.4 Heating and Cooling

The present ambient interior temperature averages 18 - 21°C and are often higher as a result of the artificial conditioning and ventilation. The present ambients interior temperatures averaged 10°C by using diesel powered, low KV/A generators, electric heaters and thermostats that mixed the fresh and warm air and cooled it. The covered walkways between the hulls were

- In the 1957 / 60s, Hulls the ambient interior temperature averaged 10°C by using diesel powered, low KV/A generators, electric heaters and thermostats that mixed the fresh and warm air and cooled it. The covered walkways between the hulls were

Original Q Hull was built:

- 9mm - 12.5 mm, 25 mm x 25 mm, gal handlings (essentially a 1.5 - 2 hour fire rated thicknesses) have been specified to all buildings since the

Block 22m³ of fuel is ready directly to the steel joists using 20m. Celsius. Thermostat, adhesives, 20x50mm, timer blocking bolts to the steel joists in the 1999 Abilition.

In the refurbishment of Q Hull 22m³ of fuel was ready on 120x50mm chipboard used and in Building 5 (the Heavey Workshop) a solid timber floor was installed.

4.3 Linkages

Prior to the refurbishment Q Hull, 20mm chipboard was specified for floor linkages to timber joists which then over time shrink.

4.2 Linkages

Over 1900,000 litres of water per day, 10 litres of seawater converts to approximately 1.4 litres of potable water. However, this ratio is temperature sensitive.
The design consultants at Works Consultancy (and later OPUS) would have been responsible for the design of the project, given the then legal requirement for all engineering design work to be certified by a design engineer, and the structure.

The arrival of tourists to Antarctica and an increased awareness of environmental issues led to a significant effort among all parties.

In terms of architecture, until the 1970s, polar stations were renowned for their widespread litter and the disregard of environmental awareness started to become part of the language in certain sectors of New Zealand society and later.

In 1970s' environmental awareness started to become part of the language in certain sectors of New Zealand society and later.

The particular challenges with the addition of various safety factors and consequences given the location of Scott Base.

The Town Planning Act did not become law until 1969.

By laws until 1964 with the introduction of the New Zealand Standards 1900 series for buildings and their component parts. The Town Planning Act formed in 1964 set out basic standards and codes which were adopted for Council approval. The Town Planning Act was then passed with any building codes which were then internal (Ministry of Works).
The Statutory Compliance Manual became effective in January 1999 with the presentation to the board of directors of the first of the required six monthly reports. A detailed listing of the tables and regulations to be compiled with are contained in the manual.

The manual, which assesses the Antartic New Zealand meets its obligations as required by the various treaties and regulations as regards its measures to ensure and implement risk management programmes, was developed by the Council of Managers of National Antarctic Programmes. Environmental monitoring activities began in Antarctica at the instigation of the Council of Managers of National Antarctic Programmes in 1994/5 with the Scott Base seaward and airfield monitoring programmes.

In January 1992, and became the manager’s initiative and hence clear for all Scott Base projects from 1993 onwards. Until 1999 the RDC’s (the Ross Dependency Research Committee) was one of the approving authorities, at that time, making recommendations to the DISR Antarctic Division. The Ross Dependency Research Committee was one of the approving authorities, at that time, making recommendations to the DISR Division.

Argentina New Zealand took over the New Zealand Antarctic Programme in 1978. This region into the late 1980s.

and approved all projects for Scott Base, and the Fuel Spill monitoring at Scott Base, and the protection of Scott Base seaward and airfield monitoring. Since then, the New Zealand Antarctic Programme has been managed by the Council of Managers of National Antarctic Programmes. Environmental monitoring activities began in Antarctica at the instigation of the Council of Managers of National Antarctic Programmes in 1994/5 with the Scott Base seaward and airfield monitoring programmes.

and approved all projects for Scott Base, and the Fuel Spill monitoring at Scott Base, and the protection of Scott Base seaward and airfield monitoring. Since then, the New Zealand Antarctic Programme has been managed by the Council of Managers of National Antarctic Programmes in 1994/5 with the Scott Base seaward and airfield monitoring programmes.

and approved all projects for Scott Base, and the Fuel Spill monitoring at Scott Base, and the protection of Scott Base seaward and airfield monitoring. Since then, the New Zealand Antarctic Programme has been managed by the Council of Managers of National Antarctic Programmes in 1994/5 with the Scott Base seaward and airfield monitoring programmes.
force (any personnel) and the design supervisors were working only 10 hours every day for 5-6 weeks; even when there was

foremost (allowing for the wind chill factor). This, together with the short construction time allowed, mean essentially that the labour

Fortunately the weather in this period of time was unseasonably sunny and warm, with only a few days being down around 8°C to

10°C to 20°C range with a few warm days and potentially some moderately strong winds.

that the weather would likely be daylight for 24 hours of the day. Visibility permitting, and the temperatures would be expected to be in the

February 1999 would have been unremarkable at best, except

than zero or 5°C. The predicted weather forecasts for January.

from blizzards, for all 24 hours a day, to moderate winds. While at the same time, temperatures are rarely ever more

the weather can be very unpredictable.

As discussed already when considering the challenges of building at Scott Base, the weather can be very unpredictable.

Plant and labour costs $400,000.

Time frame: The building is approximately 100°C and the proposed budget for materials, transport, consultant design, supervision,

however, the proposed budget is approximately 100°C and the proposed budget for materials, transport, consultant design, supervision

All Abduction blocks are complete buildings, receiving all the Specialist Services disciplines, particularly when located at Scott Base.

while over, still to fill it out over the winter months.

The new Abduction Block was designed in late 1998 and needed to be closed in by the end of February ready for the Scott Base

build projects at Scott Base.

I suggest that this scenario and statement applies equally today in 1999. Time is always of the essence when trying to design and

Frank Ponder in 1997 when told that the base had to be designed, constructed, transported, erected and occupied in less than a

6. A brief Case Study - The Abduction Block 1999

The penalties for statutory non-compliance are those that are imposed as a result of a breach of the particular Act(s).
macerated before being pumped to the sea.

Waste water from the basins, toilets and showers is taken to a sewage tank in the insulated floor recess of the building and

The foundation system supporting the structure consists of 150 x 150 timber legs (jackstuds) set on 10 in long 200 x 150 ground

panel-2 top 2 (bottom). The internal partition framing is 75 x 75 m/studwall at 6000rs. The whole of the building - walls, roof and floor/underfloor is clad with 1200 wide 250 mm thick metal clad panels fixed to the structural frame using 12mm Through steel bolts (per

the wall and roof planes, infantry from the existing roof / Hatton building. R20 bracing rods are bolted and welded to the portal columns using a gusset plate, and then run at 45° across the 2 end bays in 2 rows. Each column (portal legs), with lattice web root nussess (R24 web, 75 x 75 in top chord, 75 x 50 bottom chord), with 75 x 75 purins and

The building structure is a series of 5 steel portal frames made up of 200UB25 columns (portal legs), with lattice web root nussess (R24 web, 75 x 75 in top chord, 75 x 50 bottom chord), with 75 x 75 purins and

The ablation block is approximately 100ms and houses an extensive new laundry area, additional male / female showers and

tooles. Plant room, external waste room and a suspended water tank platform supporting 3 x 600lt water supply tanks.

The ablution block is approximately 21m x 21m long and covered with steel framing. To ensure that the building would be closed in (a fully clad shell) by February 21st

Snow falling and ice covered the steel framing.
Once a full-time resident of the site, the founder of the community now lives in a converted warehouse. The community had been initially formed as a group of people seeking to不用插件干扰,吗 raise the walls of the original building.

With no machinery to aid hand labor, the community built the walls of the building by hand.
Clearing the doorway into one of the covered ways after a blizzard.
Photograph Antarctica New Zealand.
Another question is the likely lifespan of the present buildings, including the largest, the building block. The buildings are apparently designed for a 40-year lifespan whereas it is expected to last the interiors of the buildings over 20 years. Whether there are always be a

also being required to keep the energy losses through the outer skin to a minimum is an ever-present challenge.

There is an opportunity to design future buildings using alternative technologies / materials given the flexibility of the building programmes now have to comply with.

The buildings now have to be designed to comply with the Resource Management Act 1991 in particular (refer to the Anzac and New Zealand Standard Compliance Manual for the other relevant regulations and Acts that all

safety factors in regard to bearing, numbers ofings, for instance, the seismic systems employed now are very different to the wire

Describing the demands and essentially unknown conditions in 1996 would have meant incorporating many contingencies and

The Design and Construction Challenges and Opportunities

The move to consulting of contractors as proposed by Anzac and New Zealand will create a"new" industry in competition for the

settings for a new industry. A"new" way of doing business and a"new" way of doing business, so one of the

The Delivery Time for the Design, Documentation, Construction and Operation is still a very high performance and one of the

individual components' performance. No compromise allowed, still means the components need to be maintained, into position.

Community and quality, and construction, are coming in to action.

Very little has in fact changed conceptually. Soil base is still remote, even though more rigorous and plans with larger pay loads,

Analytical Summary

7
Construction techniques / technologies have changed and yet in many ways they have stayed the same.

The buildings, as previously stated, are designed to comply with the Building Act 1991 and the Resource Management Act 1991 in way the same as in Australia.

This system is particularly noticeable in terms of disposal, whether waste or wastewater, waste recycling, waste removal, and the evolution of changes that have occurred in the last 40 years, in terms of statutory compliance and their activities, now all programmes personal and associated personal and their activities, now associated personal and their activities, now all programmes personal and associated personal and their activities.
Face will be on again to meet those light deadlines.

There is no plan for any further buildings at Scott Base, but that could change at any time, and probably will. And the

University of New Zealand's Science is one of the leading developers of strategies and policies for the present government. At

non of minimally subsidised, Building Programmes cost and what Government strategies and policies the need to be met, as

cost $400,000 for a 100m^2 building and was a necessary extension of existing services at the base. What will future high tech

with and strategically to move ahead of others in the international scientific community. The 1999 University Block was budgeted to

buildings and facilities and was essentially in response to the strategy for expanding scientific knowledge at a rate to keep up

of Earth's physical processes. The 1976-78 Building Programme cost approximately $1 million for 5-6 moderately scaled

Australasian. The strategy was one of supporting the Commonwealth's Terra Australis Expedition and becoming part of the Network

329,653 pounds. 100 buildings and 4大力士 (budgeted for $1200 pounds) for 6-8 Highs and a series of 9 Telecommunication

Scott Base

management. This will very certainly be the situation reference, I suggest, for the future "bases" and any further extensions to

Build Programmes. Identified critical, innovative and effective designs, materials, installation procedures and project

Fire resistance requirements are and have always been of paramount importance in any design and build programme for Scott

structure against the wind and any potential seismic activity. The method of providing the foundation system for the Hangar

laid on the perimeter of ground, however the new innovation is to use reinforcing steel, conceivably in 5,600 (and another, the
21 Dec 1956 (HMS Endurance) 21 Dec 1956 (HMS Endurance) with the planes, building components, some of the dogs and NZ personnel (see NZ. 21 Dec 1956 (HMS Endurance) with the planes, building components, some of the dogs and NZ personnel (see NZ. with
NZS Prince John R. Tolmer. Fuel and most of the dogs)

1956-8. The assembly of the prefabricated Scott Base Huts at Ross Island (Wellington Airport now) gave the public a chance to view it too.

Huts C and H. 3. Island motors, 3. Seismographs
Hull F. Generators and workshop
Hull E. Aircraft and Generators
Hull D. Sleeping for 6 plus medical room
Hull C. Sleeping for 14 (each cubicle 4 x 2.4 m)
Hull B. Science lab and darrom
Hull A. Mess, Radio, Leaders Office

Ponder believed that he had designed them for a 100yr lifespan,

(what would his have covered?)

Several of the huts designed connected by covered walkways. Projected cost £12.000. Actual cost £39.69. 669 10 shillings and 4 pence.

Suitable site agreed on by Dr. Hamilton, as the hillside at the junction of the Ferrar and Powers Pediment, glaciers near Butter Point.

Summer 1956/6

(see Ponder's Notes)

The design had been one that could be prefabricated and broken down into component parts to fit into the hold of a small ship.

The design had been one that could be prefabricated and broken down into component parts to fit into the hold of a small ship.

From Ponder's own architect, WARD given the task of designing the new base. Ross Sea Comm decided to name it Scott Base.


Chronological Order of Construction Work

Appendix 1
- 04 Jan 1957 Endeavour arrived off Butter Point
Re Butter Point...Ground reconnaissance team suggested that Sea Ice conditions would make landing the supplies very difficult, and that the surface was not satisfactory for aircraft operationss or for ground parties wanting to access the plateau (all primary criteria)
Hillary and Miller using Helicopter off of USS Glacier and at Rear Admiral Geo Dufek's (US Navy) suggestion..decided on 'Pram Point' (named after Scott's wooden dinghy left there in 1901-4) on SE side of Hut Point Peninsula.
Pram Point allowed open water to be crossed if the sea ice broke out, it was above the sea ice level, had a volcanic rock surface, and plenty of land for building (plus masts and aerials)
Location was close to Winter Quarters Bay (US Navy Air Ops Facility)
- 09 Jan First supplies offloaded to Pram Point
- 12 Jan ..A Hut started (8 personnel-3 army, 3 sailors, Heke and Mitchell) worked 'round the clock'
- 14 Jan..Hut containing the stove, ice melter and water tank complete (one of the 3 smaller huts)
- 20 Jan..A Hut (the Mess ) completed..1330 hrs NZ flag hoisted for first time..on the flagpole recovered from Hut Pt where Scott had placed it in 1902-1904
- 26 Jan..A, E, F Huts complete
- 12 Feb All huts completed (6 + 3) and covered ways 50% complete, 2/9 radio antennae masts erected. Huts painted yellow and orange !!
- March 1958 QUOTE..(Sir) Geo Laking Secretary of External Affairs writing to the NZ Prime Minister “ in Scott Base NZ has a first rate Base of excellent design and construction, which is readily accessible, a base for which maintenance costs will not be high ” the 1958 / 59 operational budget for Scott Base being set at £31, 200

[ Ross Sea Committee disbanded, NZ commits to continued research and exploration, RDRC formed, SCAR held its first meeting and in 1959 NZARP anagram used for first time in 1959 report to SCAR.]

- 1958 /9
Australian made prefabricated Hangar assembled by Heke (construction leader), 7x NZ Army engineers plus 2x MWD personnel..for the Beaver and Auster planes (latter back in NZ..the Beaver crashed and written off before able to use the hangar.).
Prefabricated Power House erected to house the new generators
Cable laid up to, and Auroral radar hut (2.5 x 5m) built, at Arrival Heights
Research Report that Scott Base facilities fast becoming inadequate for the expanding Antarctic Programme

- 1973/4
  - Antarctic Division

Highテンポラリインフラストラクチャー建設: Partly in response to the call for the need for environmental awareness by the DSIR

- 1972/3
  - Large windows installed in kitchen / Mess
  - Metal trough installed on the boardwalk to drain water away following a thaw.
  - Board walk in walkways laid on to scorea lateral enhanced with electronic heating tapes under the boards & a heated board walk & a
  - Heel exchange system incorporated to heat the base & pot water & a freezer installed.
  - 2x 65kVA Generators replace the 48kVA system (now 53yrs old).

- 1967/8

The yellow scheme changed to willow green (initiated by Bob Thompson). Boy Scouts and Boys Brigade visit to the base.

- 1966/7

First 'Managed Areas' established in Antarctica. Scott Base and McMurdo Station designated as Central Station Complexes with

- 1964/5

...Rubbish still disposed of in the pressure ridges...

Science lab upgraded.

New Administration Building, improvements to the Abidjan Research Laboratories, Mess enlarged and upgraded, new Seismograph building and

By 1964/5 Building Programme completed

Temporary base to permanent scientific facility.

NZ Govt announced that Scott Base was now a Permanent Antarctic Facility. Hence 61300 was allocated to transform the

NZ 3 May 1962

A sum of £25,000 Govt funding allocated for additional buildings and alterations

Mid 1961

New darkroom built

1960
New Ablutions Block built.

1999.

Hangar need with light weight steel ribbed panel sheeting over the canvas cladding.

1989.

A. Hull shielded and becomes known as the TAE Hull.

Heavy Vehicle Workshop completed (Block 7).

1987.

Workshop and machine shops completed (Block 6).

1986.

Navigation Geosciences Lab completed (Block 5).

1984.

New Command Centre opened (Block 4).

1983.

New Mess completed (Block 3).

1982.

Reverse osmosis (desalination) water distillation plant installed. Produces about 5500 liters of fresh water daily.

1979.

New Q Hut and Powerhouse for the 135kVA generators and accompanying mechanical and electrical services.

1978.

2 storey prefabricated accommodation and Science Block built.

1977.

Original Q Hut removed.

1976.

Formaldehyde chemical toilet system (liquid recycling system) installed.

1976.

Toilet blocks replaced with dry sacks.

1976.

Severe storm severely damages N Hut and the Vehicle Store and Generating Plant Buildings.
Indicative Illustrations of the Various Building Programmes

Appendix 2
Base (Stage 6 1983), Photograph Antarctica, New Zealand.
Cross Section of Sea Hose

Sea Water System

Flexible hose

65mm Blue Helm

Door

Wet Lab

Sea Hose

Water System Schematic

System

Exhaust Valve

Sea Valve

Pump Station

Suction Valve

65mm Water Pipe

Existing 37mm

65mm Blue Helm
MESS BLOCK VENTILATION SCHEMATIC

AIR FLOWS THROUGH WALL GRILLES

UNTIL KITCHEN HOOD OPERATES.

RECYCLATED

WHEN HOOD OPERATES,
MOTORISED DAMPER CLOSES

0.4 M/S OR

1.0 M/S

2 SP FAN

UP TO

1.0 M/S

CEILING OUTLETS

FRESH

EXHAUST

EXHAUST

WILL CAUSE THE BUILDING TO OVERHEAT.

IMPORTANT: OPENING OUTSIDE DOORS AND ESCAPE HATCHES

WALL GRILLES

BUILDING ENVELOPE

FLOOR SPACE

BAR EXTRACT

FAN WITH CONTROL SPEED

VENTILATORS
Statutory Compliance Manual – an overview

Appendix 3
ANTARCTICA NEW ZEALAND

STATUTORY COMPLIANCE MANUAL – NEW ZEALAND, ANTARCTIC AND TRANSIT ACTIVITIES

FIRST EDITION – NOVEMBER 1998
# Table of Contents

## Foreword

## Compliance Manual Update

## Compliance Manual Distribution

### Section One: Overview of Legislative Compliance Manual

1. **Introduction**
   - Objective
   - Background
   - Employment
   - Building Compliance
   - Environmental Compliance
   - How does the manual work?

2. **What Does Compliance Involve?**
   - Compliance principles
   - The concept of "materiality"
   - Features of compliance programme

3. **What are the Consequences of Non-compliance?**
   - Statutory penalties
   - Court awarded damages
   - Indirect consequences
   - Corporate liability versus individual liability
   - Strict liability

4. **Legal Process**

### Section Two: Compliance Assurance Reporting

2. **Introduction**
   - Objectives
2.2 WHO IS RESPONSIBLE?
Directors 13
Chief Executive 13
Managers 13
Compliance Officer 15

2.3 WHICH LEGISLATION IS RELEVANT TO EACH AREA?
Chief Executive 16
Compliance Officer 16
Managers 16

2.4 INDIVIDUAL MANAGERS' CHECKLISTS 17

2.5 SIX MONTHLY COMPLIANCE ASSURANCE REPORT
What is involved? 19
Compliance Assurance Report form 19

2.6 COMPLIANCE ASSURANCE REPORT 20

SECTION THREE : BREACHES 21

3.1 INTRODUCTION AND PRINCIPLES 21

3.2 BREACH MANAGEMENT PROCEDURE 22
Employees 22
Managers 22
Compliance Officer 22
Chief Executive 22

SECTION FOUR : LEGISLATION SUMMARY 23

4.1 INTRODUCTION 23

4.2 ACTS INCLUDED IN THIS MANUAL 24

SECTION FIVE : CHECKLISTS 25

SECTION SIX - APPENDIX 27
6.1 Discussion of whether New Zealand domestic environmental legislation applies in Antarctica as at 18 July 1997
SECTION ONE: OVERVIEW OF LEGISLATIVE COMPLIANCE MANUAL

1.1 INTRODUCTION

Objective
This manual has four objectives:

(i) to provide directors and all staff with easily accessible information as to the legislation that applies to Antarctica New Zealand;

(ii) to put in place a system whereby the organisation can verify compliance with the relevant law with certainty;

(iii) to confirm the importance of systematic legislative compliance as part of our organisation’s culture;

(iv) to protect the reputation of the organisation and its staff as a corporate citizen that actively ensures that it complies with the law.

The compliance programme will apply to Antarctica New Zealand’s activities both in New Zealand, Antarctica and in transit between the two locations.

Background
Organisations, like individuals, must comply with the law. The laws that govern organisations in New Zealand (and potentially in transit to Antarctica and in Antarctica) are many and varied. There are more than 150 statutes that affect the operation and management of organisations like Antarctica New Zealand.

However, it has been determined that this manual is to be restricted to those areas of law where it is reasonably foreseeable that breaches could arise. In this regard the manual only covers the following generic areas and relevant legislation;

Employment
- Accident Rehabilitation and Compensation Insurance Act 1992
- Employment Contracts Act 1991
- Health and Safety in Employment Act 1992
- Holidays Act 1981
- Human Rights Act 1993
- Immigration Act 1987
- Minimum Wage Act 1983 and Wages Protection Act 1983

# Chapman Tripp Sheffield Young

DRAFT: 20/11/98
• Parental Leave and Employment Protection Act 1987
• Privacy Act 1993

Building Compliance
• Building Act 1991
• Boilers, Lifts and Cranes Act 1950
• Electricity Act 1992 and Electricity Regulations 1957
• Fire Service Act 1975 and Fire Safety and Evacuation of Buildings Regulations 1992
• Food Act 1981 and Food Hygiene Regulations 1974
• Machinery Act 1950
• Smoke-Free Environments Act 1990

Environmental Compliance
• Antarctic Marine Living Resources Act 1981
• Antarctica (Environmental Protection) Act 1994
• Biosecurity Act 1993
• Dangerous Goods Act 1974
• Hazardous Substances and New Organisms Act 1996
• Maritime Transport Act 1974
• Marine Mammals Protection Act 1978
• Resource Management Act 1994
• Toxic Substances Act 1979

A = Antarctic (Statutory Compliance in Ross Dependency including out to 12 mile boundary of the territorial sea. Outside that area Best Practice Only).
A1 = Antarctic (Statutory Compliance south of the Antarctic convergence)
AA = Antarctic (Best Practice Only)
B = Transit (Statutory Compliance)
BB = Transit (Best Practice Only)
C = Christchurch/New Zealand (Statutory Compliance including out to 12 mile boundary of territorial sea)
CC = Christchurch/New Zealand (Best Practice Only)

This manual does not extend to legislation dealing with taxation, financial reporting, commercial dealings or any other statues other than those referred to above.
Antarctica New Zealand is committed to ensuring compliance with relevant legislation at every level.

Failure to comply with the law can result in fines and penalties being imposed on the organisation, its management and staff. It can also result in operational restrictions being imposed on its activities.

This manual has been designed to provide a basis for a structured and systematic process to ensure statutory compliance. It will assist staff and management to understand Antarctica New Zealand's legal obligations so that it can actively ensure compliance, and minimise the risk of non-compliance.

How does the manual work?
The manual has five sections:

- **Section One:** provides an outline of the manual and introduces the main principles and features of the compliance programme.

- **Section Two:** sets out who is responsible for complying with which legislation, and establishes a six monthly compliance assurance reporting procedure.

- **Section Three:** gives a step-by-step breach management procedure in case of breaches of legislation.

- **Section Four:** provides an easy reference to summaries of key statutes.

- **Section Five:** provides a checklist relevant to each statute, so that managers have a reference tool against which to check their operational procedures.

- **Section Six:** sets out as an appendix a discussion of whether New Zealand domestic legislation applies in Antarctica.
<table>
<thead>
<tr>
<th>ACT</th>
<th>DOCUMENT NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Antarctica (Environmental Protection) Act 1994 A,B,C</td>
<td>15712</td>
</tr>
<tr>
<td>4. Biosecurity Act 1993 C</td>
<td>15677</td>
</tr>
</tbody>
</table>

**Legends:**
- A = Antarctica - Statutory Compliance
- A1 = Antarctica - Statutory compliance south of the Antarctic convergence
- AA = Antarctica - Best Practice Only
- B = Transit - Statutory Compliance
- BB = Transit - Best Practice Only
- C = Christchurch/New Zealand - Statutory Compliance including out to 12 mile boundary of the territorial sea
- CC = Christchurch/New Zealand - Best Practice Only
<table>
<thead>
<tr>
<th></th>
<th>Title</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Machinery Act 1950 AA.BB.C</td>
<td>15703</td>
</tr>
<tr>
<td>18</td>
<td>Marine Mammals Protection Act 1978 A.BB.C</td>
<td>15757</td>
</tr>
<tr>
<td>19</td>
<td>Maritime Transport Act 1994 A.BB.C</td>
<td>15692</td>
</tr>
<tr>
<td>20</td>
<td>Minimum Wage Act 1983 and Wages Protection Act 1983 AA.BB.C</td>
<td>15693</td>
</tr>
<tr>
<td>21</td>
<td>Parental Leave and Employment Protection Act 1987 AA.BB.C</td>
<td>15694</td>
</tr>
<tr>
<td>22</td>
<td>Privacy Act 1993 AA.BB.C</td>
<td>15695</td>
</tr>
<tr>
<td>23</td>
<td>Resource Management Act 1991 A.BB.C</td>
<td>15696</td>
</tr>
<tr>
<td>24</td>
<td>Smoke-Free Environments Act 1990 AA.BB.C</td>
<td>15697</td>
</tr>
<tr>
<td>25</td>
<td>Toxic Substances Act 1979 AA.BB.C</td>
<td>15700</td>
</tr>
</tbody>
</table>

A = Antarctica - Statutory Compliance
A1 = Antarctica - Statutory compliance south of the Antarctic convergence
AA = Antarctica - Best Practice Only
B = Transit - Statutory Compliance
BB = Transit - Best Practice Only
C = Christchurch/New Zealand - Statutory Compliance including out to 12 mile boundary of the territorial sea
CC = Christchurch/New Zealand - Best Practice Only
Bibliography