PERFORMANCE-BASED CODES
WHY & HOW

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INTRODUCTION
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SINGAPORE POST-COLONIAL TRADITION

Building codes and regulations in Singapore were adapted from British codes and codes from other developed countries.
By tradition and for expediency of implementation, building codes and regulations were prescriptive – when buildings were small in scale, when it was possible to anticipate building designs and outcomes
PERFORMANCE-BASED CODES

WHY?

PRESCRIPTIVE CODES
ALLOW SPECIFICATION OF SOLUTIONS WITH EASE OF CONTROL

THE NATURE OF PRESCRIPTIVE CODES RESULTS IN THE LIMITATION OF THE RANGE OF POSSIBLE SOLUTIONS
PERFORMANCE-BASED CODES

PRESCRIPTIVE CODES – PROBLEMS

TOO RIGID
UNABLE TO KEEP UP WITH CHANGES IN DESIGN AND INNOVATION
PROBLEMS OF OVER-PROVISION
The deem-to-satisfy provisions are very conservative

Things are changing – there is a need to be more efficient

Philip Chun, Australian Building Code Consultant
The New Zealand Building Code aims to implement only the requirements needed – “what you really must do”

The approved documents are only one of the ways to fulfill the Performance Requirements – such provisions are conservative.

Dr Bill Porteous, CEO, Building Industry Authority, New Zealand
The presumption that there is only one way of providing the level of safety makes the prescriptive code rigid and inflexible

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PRESCRIPTIVE CODES - COMMENTS

The introduction of Performance-based Regulation is to relax provisions that were over-stipulated in the BCA 91

Keith Hatfield, Department of Urban Service, Canberra, ACT
PERFORMANCE-BASED CODES

Definition

A Performance-based Code specifies a required level of Performance. It allows the designer and project owner to determine the solution and method to achieve the end goal.
PERFORMANCE-BASED CODES

FLEXIBILITY

PERFORMANCE-BASED CODES ENABLE
THE APPLICATION OF ALTERNATIVE
SOLUTIONS
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AUSTRALIAN APPROACH

OBJECTIVE

FUNCTIONAL REQUIREMENTS

PERFORMANCE CRITERIA

Alternative Solution
- Equivalence to Deemed-to-satisfy Provision
- Direct Assessment against Performance Requirements

Acceptable Solutions
or
Deemed-to-satisfy Provisions
PERFORMANCE-BASED CODES

OBJECTIVE

THE OBJECTIVE CLEARLY ESTABLISHES THE INTENTION OF EACH SECTION OF THE CODE
FUNCTIONAL REQUIREMENTS

DESCRIBE THE FUNCTIONS THAT NEEDS TO BE ASSURED TO ACHIEVE THE OBJECTIVE
PERFORMANCE-BASED CODES

PERFORMANCE CRITERIA

CLARIFIES METHOD USED TO JUDGE COMPLIANCE WITH THE OBJECTIVE
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ACCEPTABLE SOLUTIONS

DEEMED-TO SATISFY

PRESCRIPTIVE SOLUTIONS
PERFORMANCE-BASED CODES

ALTERNATIVE SOLUTION

DIRECT ASSESSMENT AGAINST PERFORMANCE REQUIREMENT
PERFORMANCE-BASED CODES

SINGAPORE

CONVENTIONAL APPROACH

OBJECTIVE

PERFORMANCE REQUIREMENTS

ACCEPTABLE SOLUTIONS
PERFORMANCE-BASED CODES

OBJECTIVE

THE OBJECTIVE CLEARLY ESTABLISHES THE INTENTION OF EACH SECTION OF THE CODE
PERFORMANCE-BASED CODES

PERFORMANCE REQUIREMENTS

THE PERFORMANCE REQUIREMENTS ESTABLISH THE FUNCTIONAL REQUIREMENTS AND THE PERFORMANCE CRITERIA BY WHICH COMPLIANCE WITH THE OBJECTIVE MAY BE ASSESSED
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ACCEPTABLE SOLUTIONS

THE ACCEPTABLE SOLUTIONS REPRESENT THE ‘DEEMED-TO-SATISFY’ SOLUTIONS

PRESCRIBED SOLUTIONS

COMPLIANCE WITH THE ACCEPTABLE SOLUTIONS IS DEEM-TO-SATISFY THE REQUIREMENTS OF THE PERFORMANCE-BASED CODE
PERFORMANCE-BASED CODES

ALTERNATIVE SOLUTIONS

ALTERNATIVE SOLUTIONS MAY BE ACHIEVED BY VERIFICATION OF PERFORMANCE

BY ANALYTICAL METHODS OR MATHEMATICAL MODELS

BY SCIENTIFIC TESTS

BY METHODS ACCEPTABLE TO THE AUTHORITIES
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ALTERNATIVE SOLUTIONS

BY COMPARISON WITH ACCEPTABLE SOLUTIONS

DEMONSTRATE THAT THE ALTERNATIVE SOLUTIONS ACHIEVE EQUIVALENT STANDARD OF PERFORMANCE
EXAMPLE – LIGHTING REQUIREMENT
PERFORMANCE-BASED CODES

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PERFORMANCE-BASED CODES

EXAMPLE – LIGHTING REQUIREMENT
EXAMPLE – LIGHTING REQUIREMENT

OBJECTIVE

SAFEGUARD PEOPLE FROM INJURY, ILLNESS OR LOSS OF AMENITY DUE TO ISOLATION FROM NATURAL LIGHTING AND LACK OF ARTIFICIAL LIGHTING
EXAMPLE – LIGHTING REQUIREMENT

PERFORMANCE REQUIREMENT

LIGHTING PROVIDED FOR PEOPLE IN A BUILDING SHALL BE ADEQUATE FOR ITS INTENDED PURPOSE
EXAMPLE – LIGHTING REQUIREMENT

ACCEPTABLE SOLUTION

RESIDENTIAL BUILDINGS – ONLY THE PROVISION OF NATURAL LIGHTING IS DEEMED TO SATISFY THE REQUIREMENT
EXAMPLE – LIGHTING REQUIREMENT

ACCEPTABLE SOLUTION

AGGREGATE AREA – NOT LESS THAN 10% OF THE FLOOR AREA
EXAMPLE – LIGHTING REQUIREMENT

ACCEPTABLE SOLUTION

REQUIREMENT DOES NOT INCLUDE ROOMS SUCH AS BATHROOM, TOILET, STOREROOM, BASEMENT OR CIVIL DEFENCE SHELTER
EXAMPLE – LIGHTING REQUIREMENT

ACCEPTABLE SOLUTION

ARTIFICIAL LIGHTING SYSTEM THAT COMPLIES WITH THE RELEVANT CODE OF PRACTICE
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ALTERNATIVE SOLUTION

DEMONSTRATE THAT THE ALTERNATIVE SOLUTIONS ACHIEVE EQUIVALENT STANDARD OF PERFORMANCE
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ALTERNATIVE SOLUTION

HONGKONG BANK BUILDING - LIGHT SCOOP
PERFORMANCE-BASED CODES

ALTERNATIVE SOLUTION
EXAMPLE – SAFETY FROM FALLING

OBJECTIVE

SAFEGUARD PEOPLE FROM INJURY CAUSED BY FALLING
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EXAMPLE – SAFETY FROM FALLING

PERFORMANCE REQUIREMENT

WHERE PEOPLE COULD FALL 1.0m OR MORE, FROM ONE LEVEL TO ANOTHER, A BARRIER SHALL BE PROVIDED
EXAMPLE – SAFETY FROM FALLING
EXAMPLE – SAFETY FROM FALLING

PERFORMANCE REQUIREMENT

ADEQUATE MEANS SHALL BE PROVIDED TO PREVENT PEOPLE FROM FALLING OVER AND FALLING THROUGH
EXAMPLE – SAFETY FROM FALLING

ACCEPTABLE SOLUTION

THE HEIGHT OF BARRIER AT ANY LOCATION SHALL NOT BE LESS THAN 900mm
EXAMPLE – SAFETY FROM FALLING
EXAMPLE – SAFETY FROM FALLING

ACCEPTABLE SOLUTION

THE SIZE OF OPENING OR GAP IN THE BARRIER,
100mm - RESIDENTIAL, CHILD CARE, SHOPPING
COMPLEX, PUBLIC RESORT

150mm – OTHER BUILDINGS
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EXAMPLE – SAFETY FROM FALLING

[Diagram of a person on a balcony with a railing and objects below]
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ALTERNATIVE SOLUTION?
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APPRAISSAL

RATIONALIZE CODE REQUIREMENTS

CLEARLY ESTABLISH OBJECTIVE AND PERFORMANCE REQUIREMENTS
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APPRAISSLAL

IMPORTANT THAT ‘PRESCRIPTIVE’ SOLUTIONS SATISFY THE EXACT REQUIREMENTS OF THE PERFORMANCE CRITERIA
Presumptive solutions were usually formulated through experience – some of the presumptive solutions did not fulfill the objectives of the code.

Philip Chun
Australian Building Code Consultant
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APPRAISAL

ACCEPTABLE SOLUTIONS WILL INFLUENCE BUILDING PROVISIONS

SHOULD CONTINUE TO EVOLVE WITH FUTURE TRENDS AND INNOVATIONS
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APPRAISAL

POLICY DECISIONS

NOT SUBJECTED TO PERFORMANCE EVALUATION

Example – Policy that involves Energy Conservation in Singapore
IMPLEMENTATION OF PERFORMANCE-BASED CODES IS A REFLECTION OF THE MATURING OF THE CONSTRUCTION INDUSTRY AND THE PROFESSIONS
CONCLUSION

SET STANDARDS THROUGH THE ADOPTION OF ESTABLISHED PRINCIPLES

PROVIDE PRACTITIONERS WITH TRANSPARENT SET OF GUIDELINES
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CONCLUSION

ENABLES INDUSTRY TO OPTIMIZE PROVISIONS

POTENTIAL SAVINGS IN COST
PERFORMANCE-BASED CODES

CONCLUSION

INDUSTRY WILL BE BETTER INFORMED ON BUILDING REQUIREMENTS

BETTER ABLE TO ACHIEVE STANDARD IN KEEPING WITH MODERN DEVELOPMENTS