



Building construction — Modular coordination — System of preferred numbers defining multimodular sizes

Construction immobilière — Coordination modulaire — Système de nombres préférentiels définissant les dimensions multimodulaires

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ISO/TR 8389 was prepared by Technical Committee ISO/TC 59, *Building construction*.

The reasons which led to the decision to publish this document in the form of a technical report type 2 are explained in the Introduction.

0 Introduction

An attempt to develop a system of preferred modular sizes in building has been discussed since 1970.

The very idea of this subject has been challenged as unrealistic, since nearly every ISO member body involved in the discussions has its own theory of preferred modular sizes.

Real progress was first achieved when it was decided to draw up two draft documents:

- a) a purely theoretical one, dealing only with numbers arranged in theoretical orders in an unlimited system (this document), and

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- b) a draft International Standard containing a limited series of multimodular sizes arranged in series based on an earlier choice of multimodule.

At the ISO/TC 59/SC 1 meeting in May 1977 it was decided that the numerical system should be presented in a technical report.

The reasons for this decision were

- a) Some committee members found that the theoretical approach had no practical purpose, for which reason they want it to be guidelines to other standardizers only.
- b) Some committee members found that the time was not ripe for introducing such an advanced system of guidance.
- c) Looking upon the system as a practical means of control in decentralized development, some members whose countries are highly industrialized in this field would have liked it to become a standard.

The final compromise of these conflicting viewpoints was to issue the document as a technical report in order to inform interested specialists of its content.

The rationale for the choice of this system, together with the reasons for which it has not been based on the series of preferred numbers given in ISO 3, *Preferred numbers — Series of preferred numbers*, is explained in the annex.

1 Scope

This technical report establishes a system of preference for numbers for use as the numerical factor in multimodular sizes especially for horizontal dimensions in building, and guidance for its use.

2 Field of application

This technical report is applicable to buildings of all types designed in accordance with the principles and rules of modular coordination as laid down in ISO 2848.

As the system is based on the number 3 and its multiples and as the flexibility in relation to halving and doubling of sizes is the main principle of the system, it is primarily suitable for horizontal dimensions.

3 References

ISO 1040, *Building construction — Modular coordination — Multimodules for horizontal coordinating dimensions*.

ISO 1791, *Building construction — Modular coordination — Vocabulary*.

ISO 2848, *Modular coordination — Principles and rules*.

4 Definitions

For the purposes of this technical report, the definitions given in ISO 1791 are applicable.

5 System

5.1 Values

The entire system includes all multiples of 3 arranged in doubling series. The doubling series are arranged as follows:

Series 1:	Numbers of the form $3 \times 1 \times 2^n$	($n = 0, 1, 2, 3 \dots$)
Series 3:	Numbers of the form $3 \times 3 \times 2^n$	($n = 0, 1, 2, 3 \dots$)
Series 5:	Numbers of the form $3 \times 5 \times 2^n$	($n = 0, 1, 2, 3 \dots$)
Series 7:	Numbers of the form $3 \times 7 \times 2^n$	($n = 0, 1, 2, 3 \dots$)
Series 9:	Numbers of the form $3 \times 9 \times 2^n$	($n = 0, 1, 2, 3 \dots$)
Series 11:	Numbers of the form $3 \times 11 \times 2^n$	($n = 0, 1, 2, 3 \dots$)
Series 13:	Numbers of the form $3 \times 13 \times 2^n$	($n = 0, 1, 2, 3 \dots$)
Series 15:	Numbers of the form $3 \times 15 \times 2^n$	($n = 0, 1, 2, 3 \dots$)
Series 17:	Numbers of the form $3 \times 17 \times 2^n$	($n = 0, 1, 2, 3 \dots$)
Series 19:	Numbers of the form $3 \times 19 \times 2^n$	($n = 0, 1, 2, 3 \dots$)
Series 21:	Numbers of the form $3 \times 21 \times 2^n$	($n = 0, 1, 2, 3 \dots$)
Series 23:	Numbers of the form $3 \times 23 \times 2^n$	($n = 0, 1, 2, 3 \dots$)
Series 25:	Numbers of the form $3 \times 25 \times 2^n$	($n = 0, 1, 2, 3 \dots$)

...

Series $2m + 1$ Numbers of the form $3 \times (2m + 1) \times 2^n$ (m and $n = 0, 1, 2, 3 \dots$)

The second factor is the odd numbers which characterize the series.

The numbers of the system are given schematically in the table.

5.2 Characteristics

The system is based only on the mathematical properties of the numbers.

The table is arranged (with series of numbers in columns) in such a way that numbers in a lower series are more flexible in relation to halving than numbers of the same order of size in higher series.

This indicates that if many possibilities of halving are important, series 1 should be preferred to series 3, series 3 to series 5, etc.

Other considerations can however be of equal importance. Figures from series 3, 9, 15 and 21 contain supplementary factors of 3 and can therefore be divided again¹⁾ by three still giving multimodular sizes; numbers in series 5, 15 and 25 contain the factor of 5 and can be divided by 5 in multimodular sizes.

Furthermore, considerations of a technical or functional nature can indicate that numbers from a higher series should have preference.

6 Application

This system of preferred numbers — which are all multiples of 3 — is developed as a tool for quick judgement of the mathematical properties of numbers which can be used for horizontal multimodular sizes in building.

The system can also be used for systematic arrangement of series of multimodular sizes by telescoping a limited number of series in the system.

The system can be limited by choosing upper limits.

The development of the system and further information on its practical application are included in the annex which is not intended to form an integral part of any future International Standard which might be based on this technical report.

1) As all the numbers are multiples of 3, all sizes based on them can be divided into three equal modular, but not necessarily multimodular, sizes.

Table

Multiples of 3	Doubling series														
	1	3	5	7	9	11	13	15	17	19	21	23	25	27	etc.
3	3														
6	6														
9		9													
12	12														
15			15												
18		18													
21				21											
24	24														
27					27										
30			30												
33						33									
36		36													
39							39								
42				42											
45								45							
48	48														
51									51						
54					54										
57										57					
60			60												
63											63				
66						66									
69												69			
72		72													
75													75		
78							78								
81														81	
84				84											
87															
90								90							
93															
96	96														
etc.															