

Capital Works Management Framework

Weather Events

WE 1.0

Weather Events
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Contents

1: Weather Events.....	11
1.1 Overview.....	11
1.2 Weather Events in Public Works Contracts.....	12
1.3 Met Éireann Weather Stations.....	17

Foreword

Purpose of this document

This document sets out the 90th percentile of past weather measurements for weather events described in the public works contracts (PW-CF1 to PF-CF7) as determined by Met Éireann. The data in this document should be used by practitioners when determining if an extension of time for a weather event under the public works contracts is warranted.

Note: the wording in PW-CF6 and PW-CF7 is slightly differently to the text above but means the same thing.

Note: PW-CF8 does not specifically refer to weather events but can, if necessary, be addressed under Clause 1.1 Scope.

Data to be used in threshold calculations.

In determining the 90th percentile a weather station will not be used unless there are at least 10 years of data available in the last 12 years for each calendar month. Furthermore, Met Éireann uses all available data. This means that more data is used for long term weather stations. Also if data is not available for a given month, that month will simply be ignored in the calculations.

Met Éireann quality control staff make estimates from time to time to fill small gaps in data, such estimates will be used in calculations.

Audience

This document is intended primarily for the guidance of Sponsoring Agencies embarking on capital works projects. It is also aimed at the project manager and external consultants responsible for drawing up tender documents.

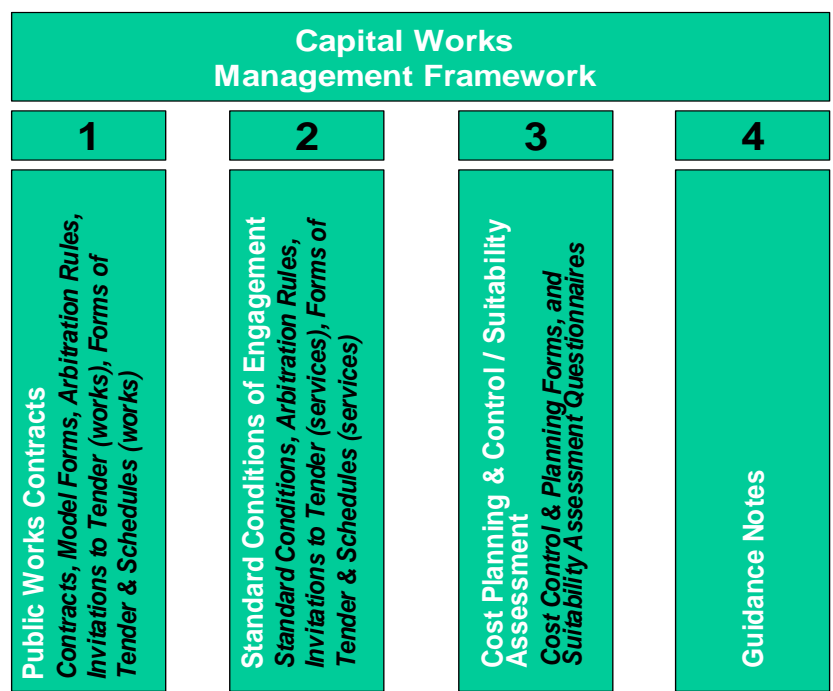
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Foreword, Continued

What is the Capital Works Framework

The Capital Works Management Framework (CWMF) is a structure that has been developed to deliver the Government's objectives in relation to public sector construction procurement reform. It consists of a suite of best practice guidance, standard contracts and generic template documents that form four pillars that support the Framework; the pillars are:

1. A suite of standard forms of construction contracts and associated model forms, dispute resolution rules, model invitations to tender, forms of tender and schedules;
2. The standard conditions of engagement for consultants, dispute resolution rules, model invitations to tender, forms of tender and schedules;
3. Standard templates to record cost planning and control information; and for suitability assessment; and
4. Extensive guidance notes covering the various activities in a project delivery process.



Continued on next page

Foreword, Continued

What is the Capital Works Framework (continued)

The content of the four pillars is outlined below. The constituent documents are coded according to the following scheme:

<i>Code</i>	<i>Description</i>	<i>Code</i>	<i>Description</i>
PW-CF	Public Works Contract Form	COE	Standard Conditions of Engagement
MF	Model Form	GN	Guidance Note
AR	Arbitration Rules	CO	Cost Planning / Control Form
ITTS	Invitation To Tender, Services	ITTW	Invitation To Tender, Works
QC	Questionnaire: Suitability Assessment for Service Provider	QW	Questionnaire: Suitability Assessment for Works Contractor
FTS	Form of Tender and Schedule	GL	Glossary
WE	Data on Weather Event		

CWMF Pillar 1 **Public Works Contracts**

Contracts, Model Forms, Arbitration Rules, Invitations to Tender (works), and Forms of Tender & Schedules (works)

<i>Contracts</i>	
PW-CF1	Public Works Contract for Building Works designed by the Employer
PW-CF2	Public Works Contract for Building Works designed by the Contractor
PW-CF3	Public Works Contract for Civil Engineering Works designed by the Employer
PW-CF4	Public Works Contract for Civil Engineering Works designed by the Contractor
PW-CF5	Public Works Contract for Minor Building and Civil Engineering works designed by the Employer
PW-CF6	Public Works Short Form of Contract
PW-CF7	Public Works Investigation Contract
PW-CF8	Public Works Short Form of Investigation Contract
PW-CF9	Public Works Framework Agreement
<i>Weather Events</i>	
WE1.0	Met Eireann's calculations of Weather Events

Continued on next page

Foreword, Continued

CWMF Pillar 1 (continued)

Model Forms	
MF 1.0	Model Forms (compendium of all model forms)
MF 1.1	Bid Bond
MF 1.2	Letter to Apparently Unsuccessful Tenderer
MF 1.3	Letter of Intent
MF 1.4	Letter of Acceptance
MF 1.5	Letter to Tenderers Notifying Award
MF 1.6	Performance Bond
MF 1.7	Parent Company Guarantee
MF 1.8	Novation and Guarantee Agreement
MF 1.9	Appointment of Project Supervisor
MF 1.10	Professional Indemnity Insurance Certificate
MF 1.11	Collateral Warranty
MF 1.12	Novation Agreement
MF 1.13	Rates of Pay and Conditions of Employment Certificate
MF 1.14	Bond – Unfixed Works Items
MF 1.15	Retention Bond
MF 1.16	Appointment of Conciliator
MF 1.17	Bond – Conciliator's Recommendation
Arbitration Rules	
AR 1.0	Arbitration Rules
Invitations to Tender (works)	
ITTW 1	Invitation to Tender for Works, Restricted Procedure
ITTW 2	Invitation to Tender for Works, Open Procedure
ITTW 3	Invitation to Tender, Investigation Contract under an Open Procedure
Forms of Tender and Schedules	
FTS 1	Form of Tender and Schedule: Public Works Contract for Building Works designed by the Employer
FTS 2	Form of Tender and Schedule: Public Works Contract for Building Works designed by the Contractor
FTS 3	Form of Tender and Schedule: Public Works Contract for Civil Engineering Works designed by the Employer
FTS 4	Form of Tender and Schedule: Public Works Contract for Civil Engineering Works designed by the Contractor
FTS 5	Form of Tender and Schedule: Public Works Contract for Minor Building and Civil Engineering Works designed by the Employer
FTS 6	Form of Tender and Schedule: Public Works Short Form of Contract
FTS 7	Form of Tender and Schedule: Public Works Investigation Contract
FTS 8	Form of Tender and Schedule: Public Works Short Form of Investigation Contract

Continued on next page

Foreword, Continued

CWMF Pillar 2 **Standard Conditions**

Standard Conditions of Engagement, Arbitration Rules, Invitations to Tender (services), and Forms of Tender & Schedules (services).

Standard Conditions	
COE 1	Standard Conditions of Engagement for Consultancy Services (Technical)
COE 2	Standard Conditions of Engagement for Archaeology Services
Arbitration Rules	
AR 1.0	Arbitration Rules
Invitations to Tender (services)	
ITTS 1	Invitation to Tender for Services, Restricted Procedure
ITTS 2	Invitation to Tender for Services, Open Procedure
Forms of Tender & Schedule (services)	
FTS 9	Form of Tender and Schedule, Consultancy Services (Technical)
FTS 10	Form of Tender and Schedule, Archaeology Services

CWMF Pillar 3 **Cost Planning & Control / Suitability Assessment**

Cost Control & Planning Forms; and Suitability Assessment Forms for works and services.

Cost Planning & Control Forms	
CO 1	How to Use the Costing Document (Building Works) Template
CO 1.1	Costing Document (Building Works)
CO 2	How to Use the Costing Document (Civil Engineering Works) Template
CO 2.1	Costing Document (Civil Engineering Works, Roads)
CO 2.2	Costing Document (Civil Engineering Works, Water Sector)
CO 2.3	Costing Document (Civil Engineering Works, Marine)
Suitability Questionnaires (works)	
QW 1	Questionnaire: Suitability Assessment for Works Contractor, Restricted Procedure
QW 2	Questionnaire: Suitability Assessment for Works Contractor, Open Procedure
QW 3	Questionnaire: Suitability Assessment for Works Specialist for specialist area
Suitability Questionnaires (services)	
QC 1	Questionnaire: Suitability Assessment for Service Provider, Restricted Procedure
QC 2	Questionnaire: Suitability Assessment for Service Provider, Open Procedure
QC 3	Questionnaire: Suitability Assessment for Service Provider, Independent PSDP
QC 4	Questionnaire: Suitability Assessment for Service Provider, Independent PSCS

Continued on next page

Foreword, Continued

CWMF Pillar 4 **Guidance Notes**

Guidance Notes	
GN 1.0	<i>Introduction to the Capital Works Management Framework</i>
GN 1.1	<i>Project Management</i>
GN 1.2	<i>Project Definition and Development of the Definitive Project Brief</i>
GN 1.3	<i>Budget Development</i>
GN 1.4	<i>Procurement and Contract Strategy for Public Works Contracts</i>
GN 1.5	<i>Public Works Contracts¹</i>
GN 1.6	<i>Procurement Process for Consultancy Services (Technical)</i>
GN 1.6.1	<i>Assessment of Construction Service Providers, Restricted Procedure</i>
GN 1.6.2	<i>Assessment of Construction Service Providers, Open Procedure</i>
GN 1.7	<i>Standard Conditions of Engagement, Guidance Note and Sample Schedules</i>
GN 2.1	<i>Design Development Process</i>
GN 2.2	<i>Planning and Control of Capital Costs</i>
GN 2.3	<i>Procurement Process for Works Contractors</i>
GN 2.3.1	<i>Assessment of Works Contractors, Restricted Procedure</i>
GN 2.3.2	<i>Assessment of Works Contractors, Open Procedure</i>
GN 3.1	<i>Implementation Process</i>
GN 4.1	<i>Project Review</i>
Glossary	
GL 1.0	<i>Glossary</i>

¹ The current guidance note.

1. Weather Events

1.1 Overview

Introduction The public works contracts (PW-CF1 to PW-CF7) requires that the appropriate weather station nearest the site should be named in the Schedule in relation to recording weather measurements for the three weather events identified in the Contract which are:

- Precipitation
- Air temperature
- Wind speed

Additional weather events may be added if required, however care needs be taken in selecting such events to ensure that the weather station chosen records the required measurements. It should also be noted that historical data for such events may not be published or even available from Met Éireann. Furthermore, a method of determining how the data is going to be used to determine if an extension of time is warranted will have to be devised by the Sponsoring Agency.

General considerations Where most, or all, of construction activities on a project are executed outdoors, they will be very sensitive to weather changes and therefore careful consideration must be given to both the planned duration of such a project and the weather events that are applicable under the contract for that project.

In this section This section contains the following topics:

Topic	See Page
1.2 Weather Events in Public Works Contracts Describes how weather events are calculated and the historical data used to determine entitlement to an extension of time	12
1.3 Met Éireann Weather Stations	17

1.2 Weather Events in Public Works Contracts

Introduction The reference in the Public Works Contracts (PW-CF1 to PW-CF5 - Schedule Part 1K) to weather measurements ‘... *as determined by Met Éireann and published most recently...*’ is the data published in this document. This data supplied by Met Éireann for publication is being published under the CWMF and it relates to the 90th percentile of past weather measurements for each month of the year measured at a particular location. This data will be reviewed periodically; however the frequency of such reviews will be at intervals of not less than five years and any Met Éireann updates will be published by way of revision to this document which is part of the CWMF.

Weather Event A weather event under the Public Works Contracts is an event that, provided certain conditions are met, can allow a contractor extra time (arising out of delay due to bad weather) to complete the construction of a project without liquidated damages being deducted from the contractor’s payments because of the delay.

Established 90th percentile weather thresholds for each month at particular weather stations based on historical data by Met Éireann for the three weather events identified in Schedule Part 1K of PW-CF1 to PW-CF5² should be gauged against the contract **weather measurements for a month** to determine if relief for extra time is to be allowed.

For extra time to be considered the 90th percentile for a particular event for a month will need to exceed the **weather measurement for a month** in the contract.

The three events and the weather measurements for a month in the contract are:

- The number of days with rainfall exceeding 10mm;
- The number of days with a minimum air temperature less than 0^o Celsius; and
- The number of days with maximum mean 10-minute wind speed exceeding 15 metres per second.

The weather station that applies to a particular contract is indicated in Part 1 K of the Schedule to the Contract.

The tables that follow here show the thresholds for air temperature, precipitation and wind speed. It is envisaged that the three weather events referred to above will be the norm on most projects and that the thresholds in the tables that follow relate to those events; however, additional weather measurements may be added to this list for particular projects, if required.

Continued on next page

² The same weather events are referred in Clause 2.8 of PW-CF6, and Clause 4.6 of PW-CF7.

1.2 Weather Events in Public Works Contracts, Continued

Met Éireann's calculations

The thresholds indicated in the tables below (from page 14) are derived by Met Éireann from historical data and are 90th percentile figures for each of the measurements in question.

The definition of the 90th Percentile is: ***The 90th Percentile is the lowest value which has 90% of the sample less than or equal to it.***

In other words, this may be understood as expressing the notion that a given value was unusual in a 1-in-10 sense, based on actual historical weather conditions.

The 90th percentile for a data series can be calculated as follows.

1	Given N sample of years
2	Order the data from lowest to highest.
3	Multiply N (the number of samples – years in this case) by 0.9. If this produces a whole number, the value corresponding to that number in the order is the 90 th percentile. If $0.9 \times N$ has a fractional part (as only whole numbers are possible), then the calculation will be by liner interpolation between the two nearest whole numbers selecting the lowest whole number that has 90% of the sample less than or equal to it.

Continued on next page

1.2 Weather Events in Public Works Contracts, Continued

Met Éireann's calculations (continued)

As an example, look at *Days with rainfall > 10mm for March* at Valentia, for which there is data going back 67 years. In this case the data is sorted from lowest to highest – i.e. from **0** (the lowest) to **11** (the highest number of days with rainfall in excess of 10mm). So $N = 67$, and $0.9 \times N = 60.3$.

The figure 60.3 falls between 7 and 8 days (i.e. between the 58th and 65th percentiles); so 8 is the lowest whole number which has 90% of the sample lower than it.

Rainfall exceeded 10mm on this number of days...	In this number of years...	Subtotals*	Percentile
0	8	8	12
1	10	18	27
2	13	31	46
3	7	38	57
4	7	45	67
5	5	50	75
6	5	55	82
7	3	58	87
8	7	65	97
9	0	65	97
10	0	65	97
11	2	67	100

*These are cumulative subtotals for the number of years with less than or equal to the number of days with rainfall in excess of 10mm.

In this table, 7 days is in the 87th percentile, which is not sufficient for our purpose. But 8 days brings us over the 90% threshold – if March has 8 or more days of high rainfall, it would be considered unusual, as this has historically occurred in fewer than 1 in 10 years.

Continued on next page

1.2 Weather Events in Public Works Contracts, Continued

Air temperature thresholds

The following table shows the number of days on which the air temperature must fall below 0° Celsius (at named weather stations) in order for a weather event to be deemed to have occurred. For each contract (PW-CF1 to PW-CF5)³, part 1K of the Schedule indicates the weather station whose measurements apply.

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ardee (Boharnamoe)	17	17	13	10	6	0	0	0	2	6	11	15
Ardfert (Liscahane)	11	12	6	6	1	0	0	0	0	2	6	10
Ardtarmon	7	7	5	1	0	0	0	0	0	0	1	6
Ballincurrig (Peafield)	10	10	6	6	0	0	0	0	0	1	4	8
Ballyshannon	13	12	7	4	1	0	0	0	0	1	5	9
Belmullet	9	9	5	2	0	0	0	0	0	0	3	6
Birr	15	16	13	8	3	0	0	0	1	4	11	13
Carron	11	10	6	3	0	0	0	0	0	2	4	8
Casement Aerodrome	14	14	11	8	3	0	0	0	0	4	11	11
Connemara Nat. Park	6	7	5	2	0	0	0	0	0	0	2	7
Cork Airport	11	9	7	4	0	0	0	0	0	0	6	8
Derrygreenagh	20	17	13	8	4	0	0	0	1	5	12	16
Dublin (Merrion Square)	5	8	3	1	0	0	0	0	0	0	3	5
Dublin (Phoenix Park)	17	16	12	8	2	0	0	0	0	3	10	13
Dublin Airport	15	14	10	4	1	0	0	0	0	1	7	10
Dungarvan (Carriglea)	12	13	8	6	1	0	0	0	0	3	8	10
Fermoy (Moore Park)	16	13	10	8	3	0	0	0	1	4	10	14
Fethard (Parsonshill)	15	14	11	6	1	0	0	0	0	2	6	11
Galway (Univ.Coll.)	10	11	7	2	0	0	0	0	0	2	5	10
John F. Kennedy Park	11	12	7	5	1	0	0	0	0	1	6	10
Johnstown Castle	8	9	6	3	0	0	0	0	0	0	3	7
Knock Airport	12	9	8	5	0	0	0	0	0	0	2	11
Maam Valley	8	9	5	3	0	0	0	0	0	1	4	6
Malin Head	7	7	4	1	0	0	0	0	0	0	1	3
Mount Russell	8	11	7	4	1	0	0	0	0	1	4	11
Mullingar	17	19	13	8	1	0	0	0	0	5	10	16
Shannon Airport	13	15	8	3	1	0	0	0	0	2	8	10
Sherkin Island	7	5	3	1	0	0	0	0	0	0	1	4
Straide	13	16	9	5	3	0	0	0	1	5	11	11
Valentia Observatory	7	8	5	1	0	0	0	0	0	0	3	7
Warrenstown	17	16	9	5	1	0	0	0	0	3	9	13
Waterford (Tycor)	10	12	7	4	0	0	0	0	0	0	5	9

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³ See Clause 2.8 of PW-CF6 and Clause 4.6 of CW-PF7

1.2 Weather Events in Public Works Contracts, Continued

Precipitation thresholds

The following table shows the number of days on which precipitation must exceed 10mm (at named weather stations) in order for a weather event to be deemed to have occurred. For each contract (PW-CF1 to PW-CF5)⁴, part 1K of the Schedule indicates the weather station whose measurements apply.

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ardfert (Liscahane)	9	6	4	3	5	3	4	5	6	8	7	9
Ardtarmon	5	4	3	3	5	4	3	5	4	8	5	6
Ballincurrag (Peafield)	9	6	5	5	5	6	4	7	8	8	6	7
Ballygar	6	5	3	3	4	3	3	4	5	7	6	8
Ballyshannon	6	5	4	2	3	3	5	5	6	6	5	7
Belmullet	7	4	4	3	3	3	4	5	6	6	6	7
Birr	4	3	2	3	3	4	3	4	4	6	4	4
Carron	10	9	8	5	6	5	4	8	7	10	8	12
Casement Aerodrome	3	3	2	2	3	3	2	4	3	4	3	4
Connemara Nat. Park	9	9	7	6	7	5	5	9	7	10	9	11
Cork Airport	9	8	6	4	5	5	4	6	6	7	7	8
Derrygreenagh	4	3	3	3	3	3	4	4	4	5	4	5
Dublin (Merrion Square)	3	3	2	3	3	4	3	3	4	4	4	4
Dublin (Phoenix Park)	3	3	3	2	3	3	3	4	3	4	4	4
Dublin Airport	4	3	3	3	3	3	3	4	5	4	4	4
Dungarvan (Carriglea)	9	6	5	5	5	5	5	7	6	8	8	8
Fermoy (Moore Park)	7	4	5	3	4	3	4	4	6	6	5	6
Fethard (Parsonshill)	4	3	3	3	4	5	3	6	5	6	5	6
Galway (Univ.Coll.)	7	5	5	4	5	4	4	5	6	8	7	8
John F. Kennedy Park	6	5	4	4	5	5	4	5	6	7	7	7
Johnstown Castle	8	5	4	4	4	4	4	5	6	7	7	6
Knock Airport	7	8	6	5	5	4	6	6	8	7	6	9
Maam Valley	18	16	13	9	10	9	8	13	11	14	16	17
Malin Head	5	4	3	3	3	4	4	4	5	6	6	6
Mount Russell	6	5	4	4	5	4	4	6	7	8	6	8
Mullingar li	5	4	4	3	4	4	4	4	4	5	4	6
Shannon Airport	5	4	3	3	3	4	3	4	5	5	5	6
Sherkin Island	7	6	6	5	6	3	4	5	6	7	7	8
Straide	9	7	5	3	5	3	2	5	5	7	7	8
Valentia Observatory	9	8	8	5	6	5	5	6	8	9	9	9
Warrenstown	4	4	3	3	3	5	3	4	4	5	4	5
Waterford (Tycor)	7	5	5	5	4	4	3	5	5	6	6	6

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⁴ See Clause 2.8 of PW-CF6 and Clause 4.6 of CW-PF7

1.2 Weather Events in Public Works Contracts, Continued

Wind speed thresholds

The following table shows the number of days on which 10-minute wind speed must exceed 15 m/sec (29.16kt) (at named weather stations) in order for a weather event to be deemed to have occurred. For each contract (PW-CF1 to PW-CF5)⁵, part 1K of the Schedule indicates the weather station whose measurements apply.

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Belmullet	16	15	13	7	6	4	2	4	7	10	12	13
Birr	3	2	1	0	0	0	0	0	0	0	1	2
Casement Aerodrome	13	12	11	3	3	1	1	2	4	8	9	11
Cork Airport	11	9	7	4	2	1	0	2	3	6	7	8
Dublin Airport	9	7	6	3	2	1	1	1	2	4	5	7
Knock Airport	6	9	3	2	1	0	0	0	1	3	3	5
Malin Head	23	22	20	12	9	6	5	7	13	17	20	21
Mullingar II	4	3	2	2	1	0	0	1	1	2	1	3
Shannon Airport	10	8	6	5	3	2	1	2	4	4	5	8
Valentia Observatory	10	7	6	4	2	1	0	1	2	5	7	9

⁵ See Clause 2.8 of PW-CF6 and Clause 4.6 of CW-PF7

1.3 Met Éireann Weather Stations

Introduction The weather stations listed below are stations for which data is available

Location of Weather Stations Met Éireann's main weather stations are located at:

Belmullet	Cork Airport	Shannon Airport
Casement Aerodrome Osbservatory	Dublin Airport	Valentia
Malin Head	Connaught Airport	Mullingar

Precipitation levels and temperatures In addition, precipitation levels and temperatures are recorded at the following locations:

County	Location
Clare	Carron
Cork	Fermoy (Moore Park), Sherkin Island, Ballincurrig
Donegal	Ballyshannon
Dublin	Phoenix Park, Merrion Square
Galway	NUIG, Maam Valley, Connemara National Park, Ballygar**
Kerry	Ardfert
Limerick	Mount Russell
Louth	Ardee*
Mayo	Straide
Meath	Warrenstown
Offaly	Derrygreenagh
Sligo	Ardfarmon
Tipperary	Fethard
Waterford	Waterford, Dungarvan
Wexford	Johnstown Castle, John F. Kennedy Park

* Ardee may only be used for temperature purposes due to insufficient precipitation records.

** Ballygar may only be used for Precipitation purposes due to insufficient temperature records