Capital Works Management Framework

Weather Events

WE 1.0

Weather Events

Document Reference WE 1.0 v.1.1

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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.
>
> **Note:** PW-CF10 does not specifically refer to weather events but can, if necessary, be addressed under Clause 2.4 Tasks.
>
> **Note:** PW-CF11 does not specifically refer to weather events but can, if necessary, be addressed under Clause 1.2 Task.

Data to be used in threshold calculations

In determining the 90th percentile for a weather station, the last 30 years of data will be used. A station will not be used unless there are at least 10 years of data available. In the case of rainfall and temperature data, where there are occasional gaps in data Met Éireann uses estimates to fill these in. In the case of wind measurements no estimates are used.

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.

Capital Works Management Framework (CWMF)

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. For more information on the CWMF refer to Guidance Note GN 1.0.

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
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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 Part1K of PW-CF1 to PW-CF5[1] 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 0^0 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 Part1 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.

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

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Met Éireann's calculations

The thresholds indicated in the tables below (from page 8) 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.

For rainfall and temperature a full dataset of 30 years is available using a combination of observations and estimates. In the case of wind, no estimates are used, but a minimum of 10 years of records is required.

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

1	Given N sample of years
2	Order the data from lowest to highest.
3	Multiply N, the number of years by 0.9. If this produces a whole number, the value corresponding to that number in the order is the 90th percentile. In the case of a station with a full 30 years of data this is the value ranked 27th, this is the case for temperature and rainfall. For a station measuring wind, if 0.9 x N has a fractional part (as only whole numbers are possible), then the calculation will be the lowest whole number that has 90% of the sample less than or equal to it.

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)[2], part 1K of the Schedule indicates the weather station whose measurements apply.

stno	name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2638	Ardee (Louth)	15	17	13	7	2	0	0	0	1	6	10	16
1609	Ardfert (Kerry)	11	11	7	4	1	0	0	0	0	2	6	10
1875	Athenry (Galway)	12	12	8	5	0	0	0	0	0	2	8	11
2928	Athleague (Roscommon)	13	13	10	6	1	0	0	0	0	3	9	13
6204	Ballincurring (Cork)	16	14	9	5	1	0	0	0	0	1	7	13
675	Ballyhaise (Cavan)	16	13	10	6	2	0	0	0	0	4	9	14
2375	Belmullet (Mayo)	7	6	4	1	0	0	0	0	0	0	4	6
375	Carlow (Oak Park)	13	13	9	5	2	0	0	0	0	4	10	14
1718	Carron (Clare)	11	8	7	3	0	0	0	0	0	1	4	10
3723	Casement (Dublin)	10	13	10	6	2	0	0	0	0	3	10	13
7612	Cashel (Tipperary)	15	13	10	6	2	0	0	0	0	2	8	12
2175	Claremorris (Mayo)	14	11	9	4	1	0	0	0	0	2	9	13
1626	Connemara National Park (Galway)	7	5	5	2	0	0	0	0	0	0	2	7
3904	Cork Airport	7	8	5	3	0	0	0	0	0	1	3	6
3923	Dublin (Merrion Square)	5	6	3	1	0	0	0	0	0	0	3	7
175	Dublin (PhoenixPark)	13	13	10	4	1	0	0	0	0	2	9	10
532	Dublin Airport	11	12	10	6	2	0	0	0	0	2	7	13
1375	Dunsany (Grange- Meath)	15	13	10	7	2	0	0	0	0	3	10	15
575	Fermoy (Moore Park -Cork)	15	13	9	6	1	0	0	0	0	4	9	12
2075	Finner (Donegal)	10	8	7	2	0	0	0	0	0	1	5	10
3927	Galway City	11	9	7	2	0	0	0	0	0	2	5	13
1475	Gurteen (Tipperary)	12	14	9	6	2	0	0	0	0	3	8	11
4514	John F. Kennedy Park (Wexford)	9	8	6	4	0	0	0	0	0	1	5	8
1775	Johnstown Castle (Wexford)	7	8	5	2	0	0	0	0	0	0	3	5
4935	Knock Airport (Mayo)	14	15	10	6	1	0	0	0	0	1	6	14
4827	Maam Valley (Galway)	6	6	5	2	0	0	0	0	0	1	4	6
275	Mace Head (Galway)	5	3	4	0	0	0	0	0	0	0	2	6
1575	Malin Head (Donegal)	4	4	4	1	0	0	0	0	0	0	1	3
1275	Markree Castle (Sligo)	16	13	11	8	3	0	0	0	1	5	11	14
1975	Mount Dillon (Roscommon)	14	12	10	7	2	0	0	0	0	3	9	14
5306	Mount Russel (Limerick)	11	11	7	5	1	0	0	0	0	1	6	11
875	Mullingar (Westmeath)	14	13	11	6	1	0	0	0	0	3	11	12
1175	Newport (Mayo)	7	6	5	1	0	0	0	0	0	0	2	7
1075	Roches Point (Cork)	3	3	3	0	0	0	0	0	0	0	1	5
518	Shannon Airport (Clare)	8	8	7	2	0	0	0	0	0	1	5	9
775	Sherkin Island (Cork)	4	2	2	1	0	0	0	0	0	0	1	4
3335	Straide (Mayo)	15	12	10	6	2	0	0	0	0	4	9	13
2275	Valentia Observatory (Kerry)	6	6	3	1	0	0	0	0	0	0	4	7
1812	Waterford (Tycor)	10	9	7	2	0	0	0	0	0	0	5	9

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[2] 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)[3], part 1K of the Schedule indicates the weather station whose measurements apply.

stno	name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2638	Ardee (Louth)	4	3	2	2	3	4	3	3	3	5	4	4
1609	Ardfert (Kerry)	7	6	4	4	4	4	4	5	4	7	8	7
1875	Athenry (Galway)	7	5	5	3	4	3	4	5	6	7	6	9
2928	Athleague (Roscommon)	6	4	3	3	3	3	4	4	4	6	5	8
6204	Ballincurring (Cork)	9	7	5	5	5	6	6	7	6	8	7	8
675	Ballyhaise (Cavan)	5	5	4	3	3	4	4	3	4	7	5	7
2375	Belmullet (Mayo)	8	7	6	4	5	5	5	6	6	9	8	9
375	Carlow (Oak Park)	4	3	2	2	2	4	4	4	4	5	5	4
1718	Carron (Clare)	11	10	7	5	6	5	7	9	7	8	9	13
3723	Casement (Dublin)	2	2	2	2	2	4	2	4	2	4	3	4
7612	Cashel (Tipperary)	4	4	3	3	3	5	4	4	5	7	5	5
2175	Claremorris (Mayo)	7	9	4	3	4	3	4	4	5	8	7	8
1626	Connemara National Park (Galway)	9	10	7	7	5	5	6	8	8	10	9	12
3904	Cork Airport	9	7	5	5	5	5	5	7	5	8	8	8
3923	Dublin (Merrion Square)	3	3	2	2	2	4	3	4	3	4	5	3
175	Dublin (PhoenixPark)	3	3	2	2	2	3	2	4	3	4	3	3
532	Dublin Airport	3	2	2	2	3	4	3	4	3	4	4	3
1375	Dunsany (Grange- Meath)	3	3	2	2	3	5	3	4	4	5	5	5
575	Fermoy (Moore Park -Cork)	7	6	3	4	4	4	4	5	4	6	6	7
2075	Finner (Donegal)	7	6	4	5	3	3	4	5	5	8	7	8
3927	Galway City	8	7	5	4	4	5	5	6	7	8	7	9
1475	Gurteen (Tipperary)	4	4	3	3	3	4	4	4	3	6	4	6
4514	John F. Kennedy Park (Wexford)	7	4	4	5	5	6	5	6	6	6	7	8
1775	Johnstown Castle (Wexford)	6	4	4	5	4	5	5	6	4	7	7	7
4935	Knock Airport (Mayo)	7	6	6	4	5	5	5	5	6	7	7	10
4827	Maam Valley (Galway)	18	17	13	9	11	9	9	13	12	15	15	18
275	Mace Head (Galway)	7	6	5	3	5	4	4	5	5	7	7	8
1575	Malin Head (Donegal)	7	5	4	4	3	4	4	6	5	6	7	8
1275	Markree Castle (Sligo)	7	6	4	3	4	3	5	4	6	8	7	6
1975	Mount Dillon (Roscommon)	5	6	4	3	3	3	3	4	4	6	6	7
5306	Mount Russel (Limerick)	7	6	4	4	5	5	5	6	7	8	7	7
875	Mullingar (Westmeath)	4	4	4	3	4	4	5	4	4	6	5	7
1175	Newport (Mayo)	10	10	7	5	6	5	6	8	7	9	9	12
1075	Roches Point (Cork)	6	6	4	3	4	4	5	6	5	6	6	7
518	Shannon Airport (Clare)	6	6	4	3	3	4	3	4	4	5	5	7
775	Sherkin Island (Cork)	7	6	6	5	4	4	5	6	5	7	7	8
3335	Straide (Mayo)	8	8	5	3	4	4	3	4	4	8	8	9
2275	Valentia Observatory (Kerry)	11	8	6	6	6	6	6	7	6	9	10	10
1812	Waterford (Tycor)	7	4	4	5	4	5	5	6	4	7	6	7

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

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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)[4], part 1K of the Schedule indicates the weather station whose measurements apply.

stno	name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
675	Ballyhaise (Cavan)	1	0	0	0	0	0	0	0	0	0	0	0
2375	Belmullet (Mayo)	16	15	13	7	3	3	3	3	6	9	8	16
3723	Casement (Dublin)	11	14	8	3	2	1	1	1	3	7	7	11
2175	Claremorris (Mayo)	4	6	3	1	1	0	0	0	0	1	2	3
3904	Cork Airport	8	9	5	2	1	1	0	1	2	3	4	7
532	Dublin Airport	10	11	6	2	2	1	1	1	3	4	5	8
1375	Dunsany (Meath)	3	1	1	0	0	0	0	0	0	0	1	2
1475	Gurteen (Tipperary)	4	2	2	0	0	0	0	0	1	0	2	2
1775	Johnstown Castle (Wexford)	1	1	0	0	0	0	0	0	0	2	1	0
4935	Knock Airport (Mayo)	6	7	3	2	1	0	0	0	1	2	3	5
275	Mace Head (Galway)	18	13	13	5	7	3	3	5	11	11	17	23
1575	Malin Head (Donegal)	22	23	20	11	8	5	5	5	9	15	16	21
575	Fermoy (Moore Park Cork)	0	1	1	0	0	0	0	0	0	0	0	1
1975	Mount Dillon (Roscommon)	1	1	0	0	0	0	0	0	0	0	0	1
875	Mullingar (Westmeath)	1	0	1	0	0	0	0	0	0	0	0	1
1175	Newport (Mayo)	11	6	8	3	3	2	1	1	2	5	7	11
375	Oak Park (Carlow)	3	3	3	1	0	0	0	0	1	0	1	4
1075	Roches Point (Cork)	15	20	14	6	5	3	3	3	5	9	10	17
518	Shannon Airport	7	6	5	3	2	1	0	1	1	3	4	7
775	Sherkin Island (Cork)	15	10	8	5	5	3	2	2	5	6	12	15
2275	Valentia Observatory	9	9	4	2	1	0	0	0	1	4	4	9

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[4] 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 at which all three weather elements are available

Ballyhaise (Cavan)

Belmullet (Mayo)

Casement (Dublin)

Claremorris (Mayo)

Cork Airport

Dublin Airport

Dunsany(Meath)

Gurteen(Tipperary)

Johnstown Castle (Wexford)

Knock Airport (Mayo)

Mace Head (Galway)

Malin Head (Donegal)

Fermoy (Moore Park - Cork)

Mount Dillon (Roscommon)

Mullingar (Westmeath)

Newport (Mayo)

Oak Park (Carlow)

Roches Point (Cork)

Shannon Airport (Clare)

Sherkin Island Cork)

Valentia Observatory (Kerry)

1.3 Met Éireann Weather Stations, Continued

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

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

County	Location
Clare	Carron
Cork	Ballincurrig
Donegal	Finner
Dublin	Phoenix Park, Merrion Square
Galway	Athenry, Maam Valley, Connemara National Park, Galway City
Kerry	Ardfert
Limerick	Mount Russell
Louth	Ardee
Mayo	Straide
Roscommon	Athleague
Sligo	Markree Castle
Tipperary	Cashel
Waterford	Waterford Tycor,
Wexford	John F. Kennedy Park

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