CIOB
THE CHARTERED INSTITUTE OF BUILDING

Technical Information Sheet

CIOB Planning Protocol 2021 (CIOB PP21)

Summary

In the construction industry, a programme is an essential means to manage time. It communicates the planned intent of the project, sequence of activities and tracks progress. The CIOB Planning Protocol 2021 is intended to be used by those involved in the planning of projects as a tool to be adopted to assist in the preparation and maintenance of a high-quality programme. In doing so, it sets out a series of criteria together with associated thresholds which are applied to the programme to see that quality and consistency are maintained.

The CIOB Planning Protocol 2021 enables the project team to produce a sensible and workable programme which facilitates timely delivery and effective decision-making but which could also be used to assist in the resolution of time-related disputes.

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"I welcome the Chartered Institute of Building's impressive initiative to formulate and publish a guideline on what constitutes a robust project programme. A technically-compliant programme that captures the core principles of good planning practice is fundamental in creating a document that can be trusted and relied on by the whole team. It is therefore hugely welcome that the CIOB has produced the CIOB Planning Protocol 2021. As a business, we place time management at the centre of good delivery. We always seek to implement the principles set out in the Protocol. By being included within leading project planning software, such as Powerproject, this new tool and guidance allows us to automatically run these checks on any new project programmes."

Tony Lonergan MCIOB
Head of Planning, Canary Wharf Contractors

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Preface

In the construction industry, the Programme is an essential means to manage time.

It communicates the planned intent and identifies the sequence of Activities that must be followed to enable the project to complete on time. In addition, it records the progress achieved and the as-built scenario for stakeholders. Given this level of detail, unsurprisingly, a construction Programme generally forms the basis for resolving delay-related disputes.

The development of the Programme should be an iterative process and ordinarily results in the production of a Gantt chart that reflects the full scope and quality requirements of the project and contains a series of discrete tasks (Activities), the Durations of the Activities, Logic Links between the Activities, any date or Calendar Constraints and key dates (such as start on site, watertightness, power-on, etc.) or Milestones. The Programme may also be used to capture and integrate the established budget and available resources to help manage costs. Ideally, it becomes a planning tool which can be used to guide the project as well as serve as a means of recording the progress and performance throughout the delivery period.

This guide, the CIOB Planning Protocol 2021 (known as CIOB PP21), has been produced by leading industry figures and planning practitioners in conjunction with the Chartered Institute of Building. It is intended to be used by those involved in the planning of construction projects as a tool to be adopted to assist in the preparation and maintenance of a high-quality Programme. In doing so, it sets out a series of criteria together with associated thresholds (tolerance limits) which are applied to the Programme to see that quality and consistency are maintained.

By following the principles and guidelines set out within this guide the project team can produce a sensible and workable Programme which:

- is of utmost reliability and usefulness, facilitating the timely delivery of the project, assisting in the decision-making process and comprising an accurate record of progress; and

- will, if required, assist resolving time-related disputes.

Defined terms used in this guide are explained in the included Glossary of programming terms.

1. Background
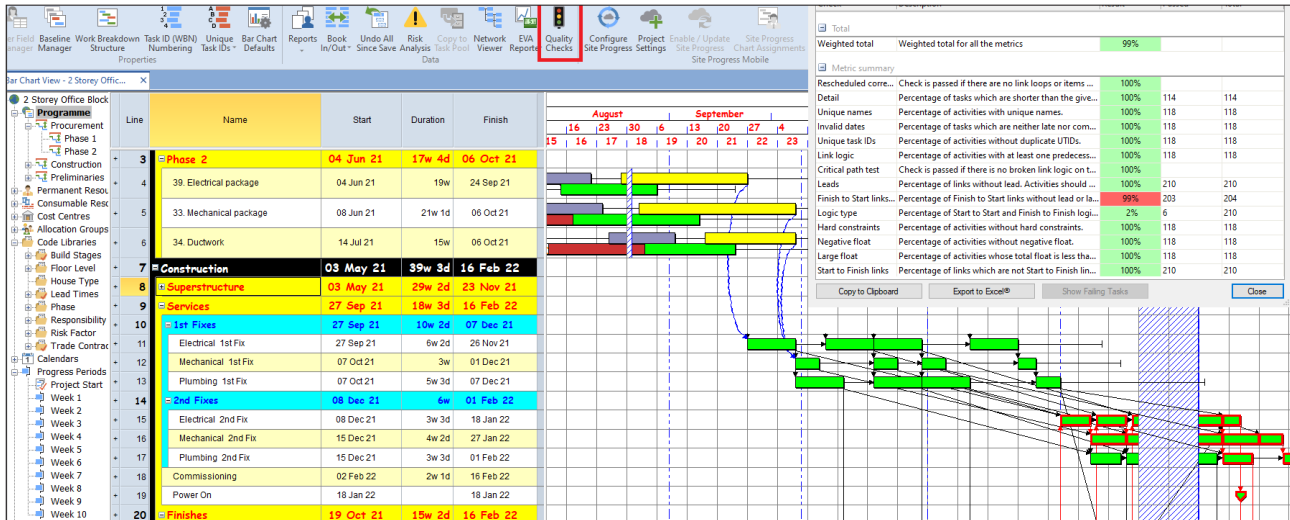
Example of Gantt chart on a construction project

Programmes are key to managing time in construction projects. In the industry, these invariably take the form of Gantt charts.

Introduction

While construction contracts typically include provisions for a Programme to be produced and used for setting out planned intent, monitoring progress and establishing entitlement to extensions of time, they are usually silent with regard to the fundamentals of planning and the form the Programme should take. As such, it is ordinarily left to the contractor to determine the format and align with best practice.

Additionally, in the absence of detailed provisions in most standardised forms of contracts it normally remains the responsibility of a client or its representatives to undertake due diligence into the Programme, but without recourse to any best practice planning guidelines, to verify the suitability of the contractor's Programme.

Unsurprisingly, the Programme produced at the outset of a project is often flawed, with no review of it undertaken at the time by, or on behalf of, an employer. Even where reviews do take place, there is often no consistent methodology applied from review to review. This generally results in inadequate Programmes being adopted by project teams.

Consequently, it is usually difficult – if not impossible – to properly understand the forecast completion date(s), the planned Critical Path, the impact of changes or delays or the as-built Critical Path. The uncertainty these limitations create in turn affect all project stakeholders.

CIOB PP21 is designed to address these issues. It is intended to be used by project teams as a tool to assist in the preparation of a high-quality Programme and keep it properly updated.

The importance of proper planning

There are a number of benefits in adopting a proper and reliable Programme for all parties, including:

- Facilitating proper management of the project
  - avoids significant negative consequences on project performance and cost
  - allows effective use of resources based upon an understanding and confidence in an accurate Critical Path
  - enables issues to be foreseen and a proper risk management process to be established for these
  - promotes better communication between the project team, as well as with third parties
  - avoids relying on poor records when making real-time decisions based upon unreliable project information

- Supporting changes under the contract
  - makes the change process far easier and less costly and produces more reliable analyses in support of changes
  - reduces the traditionally adversarial relationship often created between contract parties

- Avoiding the entrenchment of views
  - accurate Programmes provide an answer to what has happened and 'prevent myths becoming reality'
  - the extent and quality of records is usually tested following a claim or dispute

- Supporting claims and disputes
  - strong project Programmes and progress updates enable contractors to provide supporting documentation to substantiate any claims (and to favourably resolve disputes) which may arise during or after the project

The need for a standard

CIOB PP21 differs from existing planning guides which are predominately software-focussed assessments of the Programme and not designed for the mainstream construction industry. Its principal aim is to aid users in understanding the requirements of an effective Programme and act as planning guidelines which, if followed, allow the Stress Tests to be passed.

The pass/fail nature of these Stress Tests is more demanding than with other planning guides that exist. In particular, the production of a Programme Narrative, a valuable accompaniment to the Programme, allows the Programme's author to explain key assumptions and reasons as to why the Programme may deviate from the CIOB PP21's best practice guidelines.

CIOB PP21 is not merely a checklist for software applications but a vital component and benchmark for producing a high-quality Programme. Nonetheless, the Stress Tests have already been incorporated into leading planning software packages so they can be readily applied.

CIOB PP21 is devised for the mainstream construction industry. Although not specific to the country, it is tailored to the construction terminology used in the United Kingdom. This makes it easy to use with UK construction contracts, including those based on standard form construction agreements. Finally, CIOB PP21 is capable of being used on a broad range of projects. Its various tests are easily adaptable to suit any project, whatever its level of complexity.

2. The CIOB Planning Protocol 2021

CIOB PP21 sets out a series of Stress Tests to be applied to a Programme at project outset to facilitate a suitable baseline and be used for planning and progress monitoring purposes. These Stress Tests are based on best planning principles and are described later in this guide.

Their pass/fail nature makes it straightforward to know what is required of the construction Programme, removing the subjectivity that often exists with regards to assessing suitability. Any deviations to the Stress Tests are to be expressly identified and described within the Programme Narrative. The Programme Narrative should be issued in parallel with a Programme; it provides an accompanying textual narrative of the key aspects of the Programme.

The pass/fail nature enables those administering construction contracts to reject the Programme with fair and proper substantiation, with the aim of ensuring that a more suitable revised Programme is subsequently issued.

The maximum score that can be achieved for any Stress Test is 15. The actual score is explained and recorded within the *Pro formas* included within the CIOB PP21. The overall Programme score establishes the degree to which the Programme is compliant with CIOB PP21.

3. Stress testing the Programme for quality

The 15 Stress Tests set out in the CIOB PP21, together with the specific criteria to be reviewed and the thresholds to be achieved, are summarised in the table below.

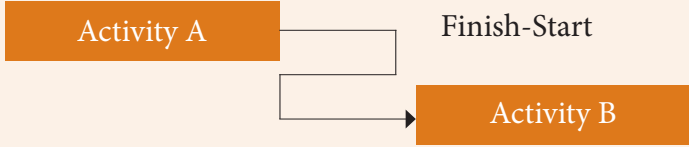The employer and contractor may choose to omit Stress Tests 3, 4 and 13 for Standard Projects.

Stress Test	Subject	Explanation	Threshold	Mandatory for Standard Projects?	Mandatory for Major Projects?
1	Logic links	Each Activity should have a predecessor and successor	0%	Yes	Yes
2	Negative Lag	There should be no Logic Links with Negative Lag	0%	Yes	Yes
3	Lead	There should be no Finish-Start Logic Links carrying Lead between Activities	0%	No	Yes
4	Logic type	Use of Start-Start and Finish-Finish Logic Links should be kept to less than 10% of total number of Activities	10%	No	Yes
5	Hard Constraints	There should be no hard Constraints	0%	Yes	Yes
6	Float	The (total) Float present should be less than twice the reporting period (where defined) or 44 working days (where silent)	0%	Yes	Yes
7	Negative Float	All Float present should be zero or above	0%	Yes	Yes
8	Long Durations	Activity Durations present should be less than twice the reporting period (where defined) or 44 working days (where silent)	0%	Yes	Yes
9	Invalid dates	Progress and remaining works should be accurately set out with no invalid dates present	0%	Yes	Yes
10	Missed detail	Detail set out in the Programme should be reflective of the full scope of the project	0%	Yes	Yes
11	Key dates	Key dates and completion dates forecast in the Programme should be reflective of obligations set out in contract documents	0%	Yes	Yes
12	Calendars	Detail set out in the Programme should be reflective of any Calendars and/or restrictions	0%	Yes	Yes
13	Unique identifiers	There should be no duplication in an assigned Activity Name or Activity ID	0%	No	Yes
14	Rescheduling	Programme can be rescheduled without any planned dates moving	0%	Yes	Yes
15	Critical path	There should be a Critical Path to each relevant completion Milestone	0%	Yes	Yes
				12/15	15/15

Stress Test 1: Logic links

Test criteria:	**Each Activity should have a predecessor and successor**
Illustration:	
Description:	*Each Activity should have at least one predecessor (connected to its Start) and one successor (connected to its Finish). This includes checking for 'dangling Activities' that have only a 'start predecessor' relationship or only a 'finish predecessor' relationship but not both.*
Threshold:	**0%**

Properly logic-linking the Programme encourages consideration of the correct relationship between Activities, facilitating a proper planning process which correctly identifies sequences and Float values.

Getting the logic wrong in the Programme can result in sequencing problems during execution. Incorrect and missing logic will result in the Critical Path and likely completion date being inaccurately calculated in light of the progress achieved.

Any exception to this rule should be identified, with the reasoning set out in the Programme Narrative.

Exceptions may involve third party interfaces and commencement/completion Milestones.

Stress Test 2: Negative Lag

Test criteria:	There should be no logic links carrying Negative Lag
Illustration:	
Description:	*Predecessor/successor relationships in the Programme need to be checked to see that there is no Negative Lag (i.e. overlap by way of a Duration of less than zero) present against the Logic Links.*
Threshold:	0%

Negative Lag is used to accelerate the sequence of Activities and is frequently used to see that the Programme fits the dates required.

In short, it hides detail in the Programme and suggests that the planning process and Programme has either not taken place or been produced to an insufficient level of detail.

The Critical Path analysis can be made more difficult or distorted through use of Negative Lag.

Overlaps between Activities are expected but planning the project to an appropriate level of detail will allow correct relationships to be modelled between Activities/Milestones.

Where Negative Lag is found, the Programme logic should be reassessed and the project broken down further so that the logic can be simplified (e.g. if an event in the predecessor task is a trigger to commence the successor task) then the predecessor should be divided into two discrete tasks.

Stress Test 3: Lead

Test criteria:	**There should be no Finish-Start Logic Links carrying Lead between Activities**
Illustration:	
Description:	*Predecessor/successor relationships in the Programme need to be checked to ensure that there is no Lead (i.e. overlap by way of a Duration of greater than zero) present against Logic Links.*
Threshold:	**0%**

In relation to Finish-Start logic, Lead is used to delay the sequence of Activities and is frequently used as an alternative to the Programme Activity, especially at the outset of producing the Programme.

In essence, they hide detail in the Programme and suggest that the planning process and Programme have not taken place or been produced to a sufficient level of detail.

Lead is often concealed in the Programme, meaning that it is hard to plan for or measure progress against. This can distort and complicate the Critical Path.

Extra detail ought to be added to the Programme in lieu of Lead in order to properly model Programme sequencing.

Whilst an overlap between Activities is to be expected, particularly in relation to complex or fast-track construction, planning the project to an appropriate level of detail allows the correct relationships to be modelled between Activities/ Milestones.

Where Lead is found, the Programme logic should be re-assessed and a new Activity added to denote the proper sequencing thus allowing the logic to be simplified.

Stress Test 4: Logic type

Test criteria:	Use of Start-Start and Finish-Finish Logic Links should be kept to less than 10% of total number of Activities
Illustration:	
Description:	*Predecessor/successor relationships in the Programme need to be checked to ensure that use of Start-Start and Finish-Finish Logic Links is kept to a minimum and that Finish-Start logic is employed as far as it is possible to do so*
Threshold:	**10%**

Both Start-Start and Finish-Finish Logic Links are typically used when producing a Programme as an alternative to fully detailing the Programme Activities or logic.

These links hide detail in the Programme and suggest that the planning process and Programme has not taken place or been produced to a sufficient level of detail. Their use can also create issues when Activities are subsequently progressed out of sequence with the remaining planned sequence and Critical Path distorted and complicated.

On the other hand, Finish-Start logic defines a clear interface between Activities and allows a logical path and resource dependencies to be more easily traced. As such, a greater level of detail ought to be incorporated into the Programme, breaking down Activities into shorter more defined ones in order to avoid the need to use Start-Start and Finish-Finish Logic Links.

Whilst overlap between Activities is expected, particularly when utilising a 'rolling wave of detail' or in relation to complex or fast track construction, planning the project to an appropriate level of detail would allow the correct relationships to be modelled.

Where Start-Start and Finish-Finish Logic Links are found in the Programme, logic is to be reassessed and new Activities should be added instead to denote proper sequencing, allowing the logic to be simplified. Where independent Activities converge at a point in time, a Finish Milestone could be used instead of a Finish-Finish Logic Link.

This Stress Test is mandatory for Major Projects but can be omitted for Standard Projects.

Stress Test 5: Hard Constraints

Test criteria:	**There should be no hard Constraints**
Illustration:	Start On Activity
Description:	*Each Activity should be driven by Programme logic and use of date Constraints should be minimised.*
Threshold:	**0%**

To be an effective planning and monitoring tool, the Programme needs to be dynamic and show a true Critical Path through to each completion date.

A hard Constraint is an artificial date applied to an Activity that blocks the logic within the Programme, manipulates the Critical Path and introduces Negative Lag. It also prevents delays from properly impacting subsequent (successor) Activities within the Programme.

Therefore 'must start on', 'must finish on', 'start no later than', 'finish no earlier than' Constraints or 'mandatory' date Constraints should not be used.

Instead, if a Constraint is necessary a 'start no earlier than', 'finish on or before' or 'deadline' type soft Constraint should be applied, as these do not disrupt the logic flow of the Programme. They allow delays to be modelled and prevent negative Float from being generated.

Alternatively, logic can be added to the Programme to show the crucial effect of a hard Constraint when it is not contractual.

Any exception to this rule needs to be identified, with the reasoning set out, in the Programme Narrative.

Exceptions may involve third party interfaces and commencement/completion Milestones.
This Stress Test is mandatory for Major Projects but can be omitted for Standard Projects.

Stress Test 6: Float

Test criteria:	**The (total) Float present should be less than twice the reporting period (where defined) or 44 working days (where silent)**
Illustration:	
Description:	*There should be no Activities or Milestones with total Float greater than twice the reporting period or 44 working days (roughly two working months) within the Programme.*
Threshold:	**0%**

High Float values indicate that the Programme has not been broken down to a sufficient level of detail, sequencing has not been properly defined or that the Programme has not been properly logic-linked.

Programme logic and any resultant Float generated need to be considered properly since understanding the relative criticality of Activities and Milestones is essential to ensure timely delivery, guard against a false sense of security and prevent occurrence of delay. High Float also affects any Critical Path analysis.

It is acknowledged that a strategic Programme produced in advance of the finalisation of a contract or construction Programme will often contain high values of Float, given the uncertainties that normally exist at early stages of the project.
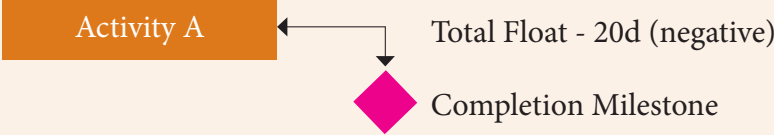
Where high Float is identified, Programme logic needs to be reviewed to ensure that predecessor/ successor relationships are properly defined. Any exception to this rule needs to be identified, with the reasoning set out in the Programme Narrative.

Exceptions may involve third party interfaces and commencement/completion Milestones.

Stress Test 7: Negative Float

Test criteria:	**All Float present in the Programme has to be zero or above**
Illustration:	
Description:	*There should be no Activities or Milestones with negative Float (i.e. less than zero total Float) within the Programme.*
Threshold:	**0%**

Negative Float within the Programme highlights that dates defined against Activities or Milestones cannot be achieved as currently planned and that the construction sequence, as defined, is unable to be achieved in line with the completion date.

Negative Float can also indicate that a delay is present against a hard Constraint which has been applied to the Programme.

Where Negative Float is identified, the Programme Constraints and logic should be reviewed to eliminate it.

Stress Test 8: Long Durations

Test criteria:	**Activity Durations present should be less than twice the reporting period (where defined) or 44 working days (where silent)**
Illustration:	Reporting Period M1 M2 M3 M4 Activity A No Activity with a duration longer than two working months (44 working days)
Description:	*There should be no Activities with a Duration longer than 44 working days.*
Threshold:	**0%**

High-Duration Activities are generally an indication that the Programme has been prepared at too high a level for adequate planning and control, distorting the Critical Path and necessitating the use of more complex logic.

Excessive Durations can make it difficult to accurately record progress.

Instead, the Programme should be broken down to a sufficient level of detail with the project and sequencing properly defined.

It is acknowledged that a strategic Programme, produced in advance of the development of a contract or construction Programme, will often contain Activities with high Durations given the unknowns and uncertainties that normally exist at early stages of the project (particularly in relation to the back end of the Programme). Similarly, it is common that some Activities – typically procurement, summary sequences and site attendances, are also defined by way of long bars within the Programme.

High-Duration Activities are, wherever possible, to be broken into several shorter Activities. Any exception to this rule needs to be identified, with the reasoning set out, in the accompanying Programme Narrative.

Exceptions can be more accurately monitored by incorporating intermediate measuring points (gateways or check points) based, where applicable on a detailed sequence.

Similarly, a further exception may exist where a rolling wave of detail is adopted when developing long Programmes of works.

Stress Test 9: Invalid dates

Test criteria:	**Progress and remaining works should be accurately set out with no invalid dates present**
Illustration:	Progress Date
	Percentage complete 0% Percentage complete 100%
	Activity Activity
	Planned start and finish dates shown in past Actual start and finish dates shown in future
Description:	*There should not be any invalid dates in the Programme where, based on the data/progress/status date, planned works are shown to be in the past or actual works as having been completed in the future.*
Threshold:	**0%**

Issues can be present where it is identified that there are forecast dates before the data (progress) date or actualised dates after it. This can mean that the dates for remaining works, and the Critical Path, are not correctly calculated.

This can result in the Programme being inaccurate and if progress is not accurately or correctly recorded, it can also be in delay.

This criteria relates both to an initial Baseline Programme and also to project performance tracking to ensure that the Programme is deliverable and the as-built dates are accurate.

What needs to be reviewed:
- Any Actual Start or Actual Finish dates after the Progress Date and;
- Any Start or Finish dates before the Progress Date which do not have a corresponding Actual Start or Actual Finish date.

Ensure that all progress is included and any late works are rescheduled, i.e. the progress line is straight-lined to ensure that all dates are achievable based on the performance to date.

It is also necessary that all tasks in the past have been properly updated, through to the Progress Date, with accurate actualised dates.

Stress Test 10: Missed detail

Test criteria:	**Detail set out in the Programme should be reflective of the full scope of the project**
Description:	*The works breakdown structure and detail set out in the Programme should be reflective of the full scope of the project and any sections where applicable.*
Threshold:	**0%**

A failure to correctly include the relevant work scope or detail within the Calendars, can result in a planned sequence being incorrect, an intrinsic delay being present or the forecast completion dates being unachievable.

The applicable scope needs to be identified from contract documents and suitably incorporated into the Programme. In addition, any relevant external interfaces (such as statutory provisions or access dates) or third party interfaces, as set out in the contract documents, also need to be included into the Programme and linked into the programmed works as applicable.

Similarly, any employer decisions or approvals, as applicable, also need to be identified in the Programme and linked into the programmed works as applicable.

Whilst the full scope of the project needs to be included, a rolling wave of detail may be adopted to reflect future and as of yet undefined/ unplanned works or when developing long Programmes of works.

Stress Test 11: Key dates

Test criteria:	**Key dates and completion dates forecast in the Programme should be reflective of obligations set out in contract documents**
Description:	*Key dates and completion dates detailed and forecast in the Programme should be reflective of the sections of works and any commencement, access, intermediate or completion dates as and when applicable.*
Threshold:	**0%**

Failure to correctly include relevant detail in relation to key dates, along with a failure to align the Programme with any applicable time related obligations, can result in a planned sequence being incorrect and the forecast completion dates being unachievable.

Additionally, failure to properly define key dates for each section of the project will affect the accuracy of the Critical Path shown.

Applicable dates need to be identified from contract documents and suitably incorporated into the Programme. These can include section access dates, completion dates and interface dates.

Where detail in relation to some sections is unknown due to as of yet undefined/unplanned works or where detail in relation to a key date is not fully defined, a 'rolling wave of detail' may be adopted to allow the future addition of detail.

The Activity ID for an access date should be prefixed with 'AD-'.

The Activity ID for a key (completion) date should be prefixed with 'KD-'.

The relevant date is to be stated within the Activity Name for each access date or key date.

Stress Test 12: Calendars

Test criteria:	**Detail set out in the Programme should be reflective of any Calendars and/or restrictions**
Illustration:	
Description:	*Activities and Milestones set out in the Programme should be reflective and planned to be delivered utilising the relevant Calendars and working restrictions where applicable.*
Threshold:	**0%**

Failure to correctly allocate Activities and Milestones within the Programme to the correct Calendars or take into account any working restrictions can result in an intrinsic delay being present and the forecast completion dates being unachievable.

Any applicable Calendars or working restrictions need to be identified from contract documents and suitably incorporated into the Programme.

Additionally, Calendars should be extended over the full Programme period and beyond to ensure that they apply in the event of any delays being incurred.

A brief description as to the applicability of each Calendar employed ought to be recorded in the Programme Narrative.

Stress Test 13: Unique identifiers

Test criteria:	**There should be no duplication in an assigned Activity Name or Activity ID**
Illustration:	ID A100 Activity A ID A100 Activity B
Description:	*The description and ID of each Activity and Milestone in the Programme should be different so as to ensure ease of identification.*
Threshold:	**0%**

The presence of duplicated Activity Names is typically reflective of sections of the Programme being copied and repeated. This often suggests that the specific detail in relation to each Activity may not have been properly considered.

Duplication and repetition of Activity Names make it harder to differentiate between works when analysing the Programme and undertaking logic and Critical Path traces.

Similarly, the duplication of Activity Names makes distinguishing similar types of works more difficult when filters are applied.

Each Activity Name should be unique. This can be achieved by using the location of the project as a prefix/suffix to the project description.

The Activity ID should, indeed, be unique (where software does not automatically generate these). This can be achieved by utilising smart codes which provide detail as to the section, location or type of works (for example).

Furthermore, where an Activity is deleted from the Programme its unique Activity/Milestone ought not to be reused and, instead, the Activity ID of the deleted Activity/Milestone should be retired (i.e. moved to a section of the Programme where redundant Activities are included so as to ensure no duplication takes place).

Retired or newly introduced Activities ought to be recorded in the Programme Narrative.

This Stress Test is mandatory for Major Projects but can be omitted for Standard Projects.

Stress Test 14: Rescheduling

Test criteria:	**Programme can be rescheduled without any planned dates moving**
Illustration:	Baseline before Rescheduling — Baseline after Rescheduling Date line Activity A / Activity B / Activity C Date line Activity A / Activity B / Activity C
Description:	*Programme should be able to be rescheduled without any dates moving as a means of demonstrating that it is properly logic-linked and dynamic.*
Threshold:	**0%**

Rescheduling (or straight-lining/time analysing) the Programme results in the planning software calculating, based on the logic, Durations and progress present, planned dates and Critical Path. Key to this is that the Programme is fully logic-linked and not unduly constrained.

When the Programme is rescheduled and it moves against that shown, it demonstrates that the Programme is unworkable in the manner set out prior to Rescheduling.

In conjunction with the others, this Stress Test will ensure that the Programme is dynamic in nature and is able to properly calculate a Critical Path.

This criteria relates both to an initial Baseline Programme and also to project performance tracking to ensure that the Programme is deliverable and as-built dates are accurate.

Where there is a movement against that planned prior to Rescheduling, it demonstrates that Programme logic is inadequate/missing or that planned dates cannot be achieved as shown.

If, after adding a baseline to the Programme and Rescheduling it, a variance in the planned dates is shown, the Programme logic and Activity Duration need to be reviewed.

Only when planned dates previously shown in the baseline prior to Rescheduling are maintained, with zero variance to each of the start and finish dates for each Activity/Milestone, is this Stress Test deemed to have been successfully achieved.

Stress Test 15: Critical path

Test criteria:	**There should be a Critical Path to each relevant completion Milestone**
Illustration:	
Description:	*Programme can be demonstrated to have a Critical Path to each relevant completion Milestone.*
Threshold:	**0%**

For the purposes of CIOB PP21, the Critical Path is the longest continuous path to the completion date (or completion dates) through the Programme.

Understanding the location of a Critical Path is essential in order to prioritise the right areas of the project, to understand client or third party interfaces are driving progress and to comprehend the effect of any potential changes.

Lack of a Critical Path (or Critical Paths) through the Programme indicates that inadequate logic and/or Constraint are present, resulting in the Programme not being dynamic in nature (and so unable to properly calculate a Critical Path).

This criteria relates both to an initial Baseline Programme and also to project performance tracking.

There ought to be at least one Critical Path present in the Programme through its entire Duration. Where, upon Rescheduling the Programme, no Critical Path (or Paths) is shown, then the Programme logic and Constraints need to be reviewed and amended.

If a Critical Path is legitimately being driven by an intermediate key date, and so by definition is not continuous through the Programme's Duration, this ought to be explained within the Programme Narrative. However, this does not distract from the fact that at least one Critical Path ought to be present through the Duration of the Programme.

4. Pro formas

Included below are pro formas which can be used for capturing the results of the Stress Tests.

Stress Test checklist pro forma for a Standard Project

Project name:	
Programme name/title:	
Programme reference:	
Check undertaken by:	
Date undertaken:	

Stress Test	Name	Description	Threshold	Pass	Fail	Exceptions Summary from Programme Narrative
1	Logic links	Every Activity should have a predecessor and successor	0%			
2	Negative Lag	There should be no Logic Links carrying Negative Lag	0%			
3	Lead	There should be no Finish-Start Logic Links carrying Lead between Activities	0%			
4	Logic type	Use of Start-Start and Finish-Finish Logic Links should be kept to less than 10% of total number of Activities	10%	Stress Test is optional		
5	Hard Constraints	There should be no hard Constraints	0%			
6	Float	The (total) Float present should be less than twice the reporting period (where defined) or 44 working days (where silent)	0%			
7	Negative Float	All Float present in the Programme has to be zero or above	0%			
8	Long Durations	Activity Durations present should be less than twice the reporting period (where defined) or 44 working days (where silent)	0%			
9	Invalid dates	Progress and remaining works should be accurately set out with no invalid dates present	0%			
10	Missed detail	Detail set out in the Programme should be reflective of the full scope of works	0%			
11	Key dates	Key dates and completion dates forecast in the Programme should be reflective of obligations set out in the contract documents	0%			
12	Calendars	Detail set out in the Programme should be reflective of any Calendars and/or restrictions	0%			
13	Unique identifiers	There should be no duplication in the assigned Activity Names and Activity IDs	0%	Stress Test is optional		
14	Rescheduling	Programme can be rescheduled without any of the planned dates moving	0%			
15	Critical path	There should be a Critical Path to each relevant completion Milestone	0%			
		SCORE:	…/15	PASS	FAIL	
						(DELETE AS APPLICABLE)

Stress Test checklist pro forma for a Major Project

Project name:	
Programme name/title:	
Programme reference:	
Check undertaken by:	
Date undertaken:	

Stress Test	Name	Description	Threshold	Pass	Fail	Exceptions Summary from Programme Narrative
1	Logic links	Every Activity should have a predecessor and successor	0%			
2	Negative Lag	There should be no Logic Links carrying Negative Lag	0%			
3	Lead	There should be no Finish-Start Logic Links carrying Lead between Activities	0%			
4	Logic type	Use of Start-Start and Finish-Finish Logic Links should be kept to less than 10% of total number of Activities	10%			
5	Hard Constraints	There should be no hard Constraints	0%			
6	Float	Total Float present should be less than twice the reporting period (where defined) or 44 working days (where silent)	0%			
7	Negative Float	All Float present in the Programme has to be zero or above	0%			
8	Long Durations	Activity Durations present should be less than twice the reporting period (where defined) or 44 working days (where silent)	0%			
9	Invalid dates	Progress and remaining works should be accurately set out with no invalid dates present	0%			
10	Missed detail	Detail set out in the Programme should be reflective of the full scope of works	0%			
11	Key dates	Key dates and completion dates forecast in the Programme should be reflective of obligations set out in the contract documents	0%			
12	Calendars	Detail set out in the Programme should be reflective of any Calendars and/or restrictions	0%			
13	Unique identifiers	There should be no duplication in the assigned Activity Names and Activity IDs	0%			
14	Rescheduling	Programme can be rescheduled without any of the planned dates moving	0%			
15	Critical path	There should be a Critical Path to each relevant completion Milestone	0%			
		SCORE:	…/15	PASS	FAIL	
					(DELETE AS APPLICABLE)	

Suggested items to include in the Programme Narrative

The aim of the Programme Narrative is that it should be read alongside the Programme and explains its structure and the assumptions that have be used to develop it.

- Programmes typically include the following information:

  a. project title, Programme title, date and number of Programme revision

  b. contract start date

  c. dates for access to the site

  d. contract section completion dates and final completion date

  e. contractor's planned dates at which section completion and practical completion of the project shall be achieved

  f. sequence, dependency and timing of the operations which the contractor plans to do in order to complete the Project

  g. critical path analysis

  h. sequence, dependency and timing of the operations which the employer or others undertaking operations on behalf of the employer, as last agreed with the contractor or, if not so agreed, as stated in the employer's requirements

  i. actual progress of partially complete or complete Activities shall be denoted by a bar showing actual progress as a proportion of the total forecast Duration of each Activity and not as a jagged vertical red line

  j. straight vertical red line denoting the date at which the progress was recorded against the Programme

  k. all Activities necessary for the preparation, co-ordination and production of the design by the contractor's design team required prior to the submission of the Design Documents under the document submittal procedure, including all key Milestones, design freezes, data drops from the Building Information Modelling model, co-ordination and progress meetings

  l. dates by which design documents shall be produced by the contractor and submitted to the contract administrator under the document submittal procedure and dates by which the contractor requires the design documents to be at 'Comment Status A', allowing time for review, comment, amendment and resubmittal

  m. dates by which samples or mock-ups to be produced by the contractor shall be submitted for approval by the contract administrator and dates by which approval of such samples shall be required by the contractor, allowing time for submittals, re-submittals and review

  n. procurement periods and delivery dates for the major items of goods, plant and materials

  o. dates by which individual buildings or areas/levels shall be ready for testing or inspecting by the employer

  p. days of working per week, shift hours per day, holidays and other non-working time. Where multiple Calendars are used, this information shall be provided for each Calendar

- The Programme Narrative shall also, by reference to the Programme, identify the dates when the contractor requires:

  a. access to part of the site where access is required if controlled by the contract administrator under a permit to work system

  b. acceptances and approvals, including statutory approvals

  c. equipment, materials or other things to be provided by the employer

  d. information to be provided by the contract administrator and others

  e. other information which it is stated in the employer's requirements that the contractor shall provide

- In addition to the above the Programme Narrative ought also to include the provisions made for:

  a. Float (free Float, total Float and end Float)

  b. time risk allowances

  c. health and safety requirements

  d. other procedures set out in the employer's requirements

- The format of the Programme shall be developed to enable filtering to illustrate:

  a. overdue Activities

  b. Activities to be completed within a defined period

  c. individual buildings and zones

  d. activity types

  e. activities in close proximity to the Critical Path

- The contractor shall also provide for each submitted Programme a narrative statement for each key operation explaining how the contractor plans to complete the operation identifying the principal elements of plant, equipment, temporary works or other key resources to be used.

5. Glossary of programming terms

Activity	a definable and measurable unit of work. Each Activity has a start date, an end date and Duration
Activity ID	an alpha-numeric unique identifier, typically generated by the planning software utilised
Activity Name	the description assigned to a schedule Activity to define the scope of work
Actual Finish	the as-built or actual date that an Activity/Milestone finished
Actual Start	the as-built or actual date that an Activity/Milestone started
Baseline Programme	a programme typically prepared prior to the commencement of a project, representing a contractor's planned intention for sequencing the works. This programme is later used as a baseline for measuring the contractor's actual progress and performance
Calendar	assigned to activities within the planning software to define working periods and non-working periods such as holidays and weekends. A project or Programme may contain many calendars each with different working and non-working periods
Completion Date	the forecast date at which each section of the works, based upon the Programme logic and sequencing, is forecast to take place
Constraint	constraining an Activity's start and/or finish by modelling its dependence to a specific date
Critical Path	the longest continuous and logical chain of activities through a Programme of Activities that establishes the overall project Duration. Any delay to the critical path (without float, accelerating or re-sequencing) will impact the completion date
Delay	a period of project/Programme overrun in comparison to the Start or Finish dates, Milestones or Baseline Programme
Duration	the length of time needed to complete an Activity
Finish	the earliest date an Activity/Milestone can complete based on the start date and original Duration
Finish-Start Logic	logic between Activities/Milestones which specifies the sequence that the Predecessor Activity is to finish before the Successor Activity is to start
Float	relevant to the total Float value and denotes the period by which a task can be delayed or extended without delaying the completion of the project
Lag	the period between the finish of one Activity/Milestone and the start of the next (resulting in a gap between them)
Lead	a period that has elapsed for one Activity/Milestone before its successor is shown to take place (resulting in an overlap between them)

Logic Link	the relationship between individual Activities/Milestones
Major Project	a project where construction works are estimated to cost at least ten million pounds sterling
Milestone	a type of Programme Activity with zero Duration, used to mark a significant event in a project
Negative Float	where the Float present is less than zero, denoting that intrinsic Delay is present
Negative Lag	an overlap between Activities/Milestones by way of logic with a Duration of less than zero resulting in a degree of parallel working
Predecessor Activity	an Activity/Milestone that must be completed/progressed before a successor Activity/Milestone can take place
Programme	a Gantt chart which is used to illustrate and specify the manner in which a project is to be sequenced
Programme Narrative	an accompanying written narrative to a submitted Programme which describes the characteristics of a Programme and areas of non-conformance with the Stress Tests
Progress Date	also typically referred to as the 'data date' and is the date on which a Programme has had its progress recorded up to
Rescheduling	a mathematical calculation performed by the planning software utilised to calculate the minimum possible time for completing the project/Programme and the float present. It is based on the progress, logic and constraints within a Programme
Standard Project	a project where construction works are estimated to cost less than ten million pounds sterling
Start	the earliest date that an Activity/Milestone can be started once its predecessor relationships and constraints are satisfied
Start-Finish logic	Logic between Activities/Milestones which specifies the sequence that the Predecessor Activity has to start before the Successor Activity can be finished
Start-Start Logic	Logic between Activities/Milestones which specifies the sequence that the Predecessor Activity is to start at the same time that the Successor Activity is to start
Stress Test	a series of tests to be applied to a Programme in order to assess the quality of it
Successor Activity	an Activity/Milestone that follows on after another Activity/Milestone

6. Authors and acknowledgements

The CIOB Planning Protocol 2021 was co-written by **Manoj Bahl, Paul Taylor** and **Keith McCall MCIOB**.

Manoj Bahl
Senior Managing Director – Construction Solutions, FTI Consulting
Manoj is an expert witness and Partner at FTI Consulting with 20 years' experience in the construction industry. He specialises in planning and programming matters and delay disputes.

He has been instructed as a programming and delay expert on a number of occasions and has experience in providing evidence in these matters as well as in the production of written reports and under cross-examination in his subject area.

In addition, he has been retained by a number of contractors to assist in the preparation of programmes and extension of time applications. He is also regularly instructed by professional teams and clients to assess time claims submitted.

Paul Taylor
Operations Director, Mace
Paul has over 30 years of planning experience spanning across many sectors of the industry.

Working for both contractors and clients, Paul has a strong understanding of the importance of good planning. Paul strives for planning to be at the forefront of project decision making and understands the contractual weight a programme holds.

As a team leader, Paul is keen that his colleagues embrace the significance of producing well-formulated programmes and that the integrity of these programmes are robust and stand up to tests.

Paul welcomed the opportunity to work alongside key members of the planning community to compile this guide for the CIOB as he sees it to be a catalyst for further improvement across our wider planning practices.

Keith McCall MCIOB
Associate, Arup
Keith is a planner and scheduler within Arup Project Management with over 30 years' experience gained from a variety of major construction projects. He has worked for main contractors, consultants and clients. He has first-hand experience of project delivery and understands the problems associated with poor and inconsistent programming.

At Arup, Keith leads a team of construction planners and schedulers providing programming expertise to both designers and clients.

His experience means that he is involved during all stages of a project's life-cycle. He is passionate about producing robust schedules because they are integral to successful project delivery.

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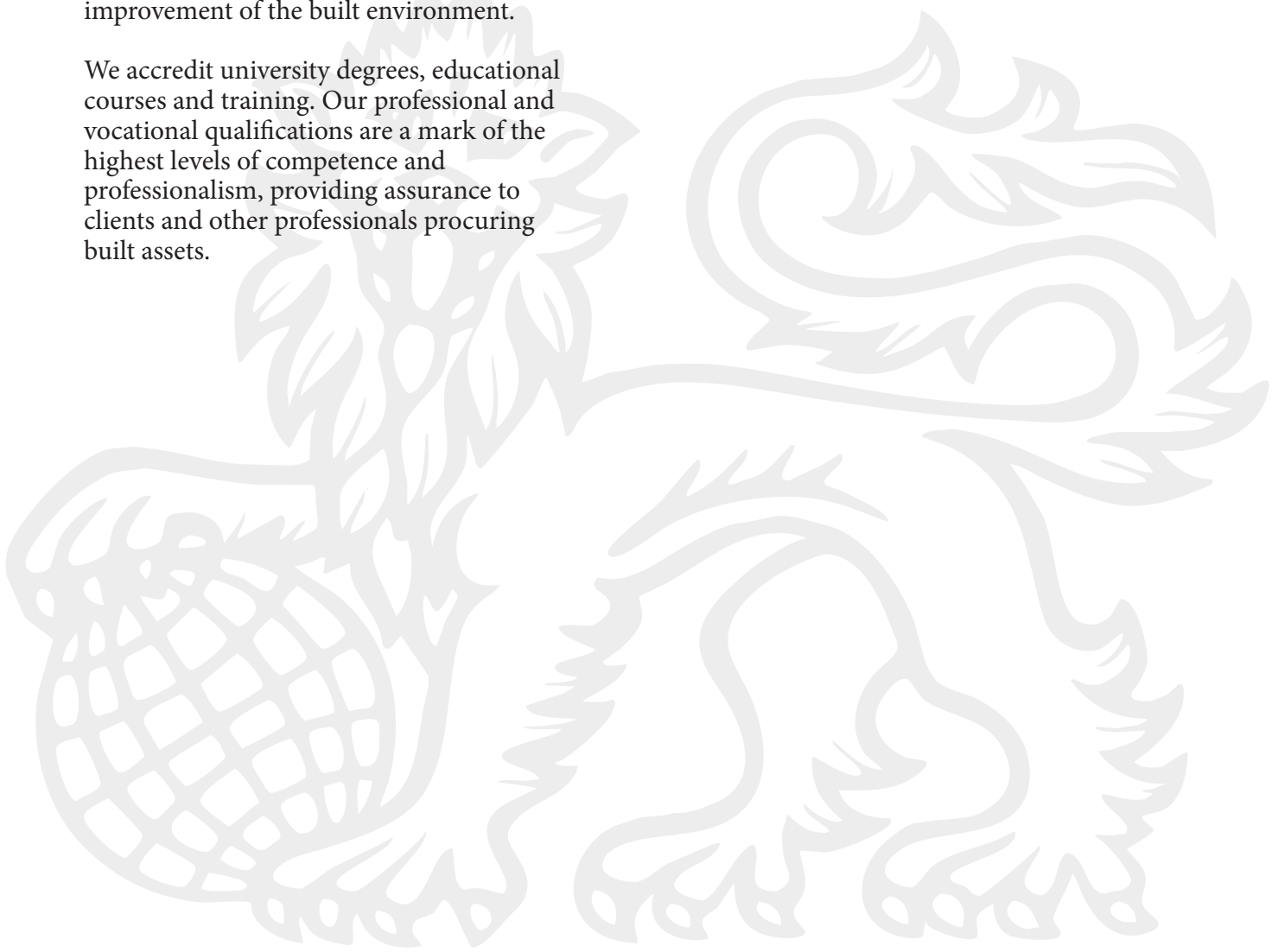
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