# PROGRESS MEASUREMENT FOR ENGINEERING AND PROCUREMENT

## ENGINEERING TECHNICAL STANDARDS & PROCEDURES

## PT KILANG PERTAMINA INTERNASIONAL

## DIREKTORAT PROYEK INFRASTRUKTUR

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## 1. INTRODUCTION

1.1 This document describes Progress Measurement for Engineering & Procurement in Contract EPC / EPCC / EPCIC.

## 2. SCOPE

2.1 This document covers the progress measurement procedure which is to be applied to PROJECT EPC / EPCC / EPCIC.
This procedure describes the way for measuring and calculating progress of Engineering & Procurement activities.

When CONTRACTOR's scope is changed due to contract changes and the changes have significant impact on progress weight factors, CONTRACTOR will consult OWNER how the changes will be treated with this procedure.

## 3. CONFLICTS AND DEVIATIONS

3.1 Any conflicts between this standard and other applicable Engineering Technical Standards & Procedures (ETSP), or OWNER standards, codes, and forms shall be resolved in writing by OWNER.

3.2 All direct requests to deviate from this procedure (ETSP), CONTRACTOR shall request in writing to OWNER for approval and shall follow internal OWNER procedure.

## 4. ABBREVIATIONS

4.1 Abbreviations used for this document shall have the following definitions:

MDR *Master Document Register*

## 1. PENGANTAR

1.1 Dokumen ini menjelaskan Pengukuran *Progress* untuk *Engineering* dan *Procurement* pada kontrak pekerjaan EPC / EPCC / EPCIC.

## 2. LINGKUP

2.1 Dokumen ini mencakup prosedur pengukuran progress yang diaplikasikan pada Kontrak Pekerjaan EPC / EPCC / EPCIC.
Prosedur ini menjelaskan langkah untuk pengukuran dan perhitungan progress untuk aktivitas Engineering dan Procurement.
Ketika lingkup KONTRAKTOR berubah karena perubahan kontraktual dan berdampak sangat signifikan pada bobot Progress, KONTRAKTOR akan melakukan konsultasi kepada PEMILIK, bagaimana perubahan akan dikelola terhadap prosedur ini.

## 3. KONFLIK DAN DEVIASI

3.1 Apabila terdapat konflik antara standar ini dengan *Engineering Technical Standards & Procedures* (ETSP) yang berlaku lainnya, atau standar PEMILIK, *codes* dan formulir, maka harus diselesaikan secara tertulis oleh PEMILIK.

3.2 Semua permintaan langsung penggunaan standar yang berbeda dari standar ini (ETSP), KONTRAKTOR harus meminta secara tertulis kepada PEMILIK untuk persetujuan dan harus mengikuti mengikuti prosedur internal PEMILIK.

## 4. SINGKATAN

4.1 Singkatan yang digunakan pada dokumen ini harus memiliki definisi sebagai berikut:

MDR *Master Document Register*

PSR *Procurement Status Register*

## 5. DEFINITIONS

5.1 The following words shall have these special meanings when used herein:

| | |
|---|---|
| OWNER | Owner of the Plant is defined as PT Kilang Pertamina Internasional and subsidiary. |
| CONTRACTOR/ CONSULTANT | Defined as The Organization to which PT Kilang Pertamina Internasional assign the work. |
| LICENSOR | Licensor Name |
| Shall | The word 'Shall' indicates a requirement. |
| Should | The word 'should' indicate a recommendation. |
| May | The word 'may' is to be understood as indicating a possible course of action |

## 6. CODE, STANDARD AND DOCUMENT REFERENCES

a. Work Breakdown Structure
b. Schedule Control Procedure
c. Progress Reporting Procedure
d. Project Calendar
e. Project Schedule

## 7. WEIGHT PERCENTAGE FOR EPC PROGRESS

Weight for Engineering, Procurement,

PSR *Procurement Status Register*

## 5. DEFINISI

5.1 Penggunaan kata-kata berikut harus memiliki arti khusus sebagai berikut:

| | |
|---|---|
| PEMILIK | Pemilik Kilang didefinisikan sebagai PT Kilang Pertamina Internasional, anak perusahaan dan afiliasinya. |
| KONTRAKTOR/ KONSULTAN | Didefinisikan sebagai Organisasi yang ditunjuk oleh PT Kilang Pertamina Internasional untuk melakukan suatu pekerjaan. |
| LICENSOR | Nama *Licensor* |
| *Shall* | Kata "Harus" menunjukkan persyaratan. |
| *Should* | Kata "Seharusnya" menunjukkan rekomendasi. |
| *May* | Kata "Mungkin" agar dipahami sebagai indikasi kemungkinan tindakan. |

## 6. KODE, STANDAR DAN REFERENSI DOKUMEN

a. Work Breakdown Structure
b. Prosedur Kontrol Jadwal Pekerjaan
c. Prosedur pelaporan Kemajuan Pekerjaan
d. Kalender Proyek
e. Jadwal Proyek

## 7. PERSENTASE BOBOT UNTUK PROGRES EPC

Bobot untuk Engineering, Procurement,

Construction and Commissioning shall be specified in the Contract, as following example:

Construction dan Commissioning harus ditentukan dalam Kontrak, sebagaimana contoh berikut:

| | |
|---|---|
| Engineering | 5% – 10% |
| Procurement | 45% – 65% |
| Construction | 30% – 45% |
| Pre-commissioning/Commissioning | 0% – 8% |

## 8. ENGINEERING

8.1 Weight Percentage for Each Discipline

Weight of Progress Engineering is developed based on deliverables list per discipline. Total deliverable is calculated from estimated manhour. Weight of each discipline is calculated based on ratio manhour for each discipline divided by total manhour for all engineering activities.

Engineering deliverable progress to be measure based on weight percentage of milestone document submission. Each engineering document to be weighted to the standard of estimated manhour to produce that deliverable.

Each discipline category is weighted proportionally to the specific estimated man-hours for that Project as per example below:

## 8. ENGINEERING

8.1 Persentase Bobot untuk Setiap Disiplin

Pembobotan untuk progress *Engineering* dibuat berdasarkan *deliverables list* per disiplin. Masing-masing jumlah deliverable dihitung dari *man hour* yang dibutuhkan. Bobot masing-masing disiplin dihitung berdasarkan ratio antara *man hour* untuk disiplin tersebut dibagi total dari *man hour* untuk *Engineering*.

Progress untuk deliverable *engineering* akan diukur berdasarkan persentase bobot dari *milestone dokumen submission*. Setiap dokumen *engineering* akan dibobot terhadap standar estimasi *man hour* untuk menghasilkan deliverable tersebut.

Setiap kategori disiplin dibobot secara proporsional terhadap estimasi spesifik dari *man hours* untuk proyek tersebut dengan contoh sebagai berikut:

| **Category**<br>Kategori | **Weight in Engineering (%)**<br>Bobot dalam Engineering (%) |
|---|---|
| Project Management | Based on Weight Calculation<br>*Sesuai perhitungan bobot* |
| Process | |
| Stationary Equipment | |
| Piping | |
| Electrical | |
| Control & Instrument | |
| Civil | |
| Steel Structure | |
| Architecture | |

| | |
|---|---|
| HVAC | |
| Safety | |
| Engineering Review Activities | |
| Vendor Data Review Activities | |
| Overall | 100% |

Weight percentage calculation for each discipline:

WVe disc (%) = Total Manhour / discipline / Total Man Hour Engineering

Example of Weight percentage calculation:

- 1 deliverable need 30 – 150 manhour
- Total deliverable of Project Management discipline = 50 deliverables
- Manhour= total deliverable x Manhour/deliverable.
- man hour= 50 x 30 = 1,500 manhour.
- Total man hour Engineering = 300,000 Manhour.

Wve discipline (%) = 1,500 / 300,000 =0.5%

Where:

WVe : Weight percentage for Engineering

The progress representing the achievement of engineering Progress will be calculated for the following categories with the progress steps agreed between OWNER and CONTRACTOR.

Cumulative Progress milestones achievement for engineering document as per example below:

- 1st issue of Engineering document: 40% (cumulative progress)
- 2nd issue of Engineering document: 70% (cumulative progress)

Perhitungan Persentase bobot per disiplin:

WVe disc (%) = *Total ManHour* / disiplin / *Total Man Hour Engineering*

Contoh Perhtungan Persentase bobot:

- 1 deliverable membutuhkan 30-150 Manhour.
- Jumlah deliverable untuk kategori Project Management = 50 Deliverables.
- Jumlah man hour= jumlah deliverable x Manhour/deliverable.
- Jumlah man hour= 50 x 30 = 1.500 manhour.
- Total man hour Engineering = 300.000 Manhour.

Wve discipline (%) = 1.500 / 300.000 =0,5%

Dimana:

WVe : Persentase Bobot untuk Engineering

Progress yang mewakili pencapaian progress *engineering* yang akan dikalkulasi sesuai dengan kategori berikut dengan tahapan progress yang disetujui antara PEMILIK dan KONTRAKTOR.

Pencapaian *progress milestone* secara kumulatif untuk Dokumen Engineering dengan contoh sebagai berikut:

- *1st issue of Engineering document: 40% (cumulative progress)*
- *2nd issue of Engineering document: 70% (cumulative progress)*

- 3rd issue of Engineering document: proportional progress (cumulative progress)
- Approved by Owner: 90% (cumulative progress)
- Issue for Construction (IFC) / issued for Record: 95% - 100% (cumulative progress)
- As Built: 100% if condition IFC cumulative progress 95% or not calculated as progress but calculated to milestone as requirement of Operational Acceptance atau Final Acceptance.

Note:
If there any changes in numbers of total planned key document during the EPC period, CONTRACTOR shall inform OWNER through submitted MDR (Master Document Register). The information should contain list of additional or deleted/superseded key documents.

Therefore, related to Engineering Progress achievement, detail of calculation shall be submitted by CONTRACTOR to OWNER on monthly basis that consist of, but not limited to:

a. Key-Document Issue Status List Check Sheet.
b. Engineering Progress Data Input numbers.
c. Addition and deletion/superseded Key documents with justification.

Detail of monthly engineering progress calculation included in *Master Document Register* (MDR).
Addition and deletion/superseded quantity of engineering deliverables shall not

- *3rd issue of Engineering document: proporsional progress (cumulative progress)*
- *Approved by Owner: 90% (cumulative progress)*
- *Issue for Construction (IFC) / issued for Record: 95% - 100% (cumulative progress)*
- *As Built*: 100% jika IFC cumulative progress 95% atau tidak dihitung sebagai progress namun dimasukkan ke dalam milestone sebagai syarat *Operational Acceptance* atau *Final Acceptance.*

Catatan :
Jika terdapat perubahan dalam jumlah dokumen utama yang telah direncanakan selama periode EPC berlangsung, KONTRAKTOR harus menyampaikan kepada PEMILIK melalui dokumen MDR (*Master Document Register*). Informasi harus berisi daftar list penambahan atau pengurangan/perubahan dokumen utama.
Sehingga berkaitan dengan pencapaian progress *Engineering*, detail dari perhitungannya disampaikan oleh KONTRAKTOR kepada OWNER setiap bulan dengan isi tidak terbatas pada:

a. Lembar Check daftar status penerbitan dokumen utama.
b. Jumlah input data Progres *Engineering*.
c. Daftar Penambahan dan penghapusan / penggantian Dokumen Utama dengan justifikasi.

Detil dari perhitungan progress *engineering* bulanan dimasukkan ke dalam Master Document Register (MDR).
Penambahan dan pengurangan / penggantian jumlah pada deliverables

change the weight of each discipline in engineering progress. Adjustment of weight can be done only for the documents within the discipline explained above.

dokumen Engineering tidak merubah bobot pada tiap disiplin dalam progress *Engineering*. Penyesuaian bobot hanya dilakukan pada dokumen-dokumen dalam disiplin yang dijelaskan di atas.

8.2 3D Modelling

3D Modeling works will be progressed as engineering progress. Expected progress milestones for 3D modeling as per example below:

8.2 3D Modelling

Pekerjaan 3D Modelling akan diprogreskan sebagai progress *engineering*. Progress milestone yang diharapkan untuk 3D Modelling sebagai contoh dibawah:

| Milestone | Cummulative Progress |
|---|---|
| 30% - 3D Model Review | 30% |
| 60% - 3D Model Review | 85% |
| 90% - 3D Model Review | 100% |

If required additional progress milestone, shall be defined and approved by OWNER in Project Progress Measurement Procedure.

Apabila diperlukan step tambahan harus diatur dan disetujui oleh PEMILIK dalam Prosedur Pengukuran Kemajuan Progress.

8.3 HAZOP Study

HAZOP Study will be progressed as engineering (process) progress. Expected progress milestone for HAZOP Study as per example below:

8.3 Studi HAZOP

Studi HAZOP akan diprogreskan sebagai progress *engineering* (disiplin proses). Progress *milestone* yang diharapkan untuk studi HAZOP adalah sebagai contoh dibawah:

| Milestone | Cummulative Progress |
|---|---|
| HAZOP Review Meeting | 100% |

If required additional progress milestone, shall be defined and approved by OWNER in Project Progress Measurement Procedure.

Apabila diperlukan step tambahan harus diatur dan disetujui oleh PEMILIK dalam Prosedur Pengukuran Kemajuan Progress.

8.4 Engineering Progress Calculation Method

Engineering progress is sum up of each discipline progress. Discipline progress is sum up of progress of each deliverable based on deliverables.

The following is engineering progress calculation formula (percentage subject to

8.4 Metode Kalkulasi Progres *Engineering*

Progress *Engineering* dijumlahkan untuk progress setiap disiplin. Progress disiplin adalah jumlah progress dari setiap progress berdasarkan deliverables.

Formula kalkulasi perhitungan progress *engineering* (persentase tunduk kepada

Engineering Key-Documents milestones progress achievement) as follow:

$$Ep = \Sigma (PCe * WVe) / \Sigma (WVe)$$

Note:
Ep : Engineering Progress (%)
PCe : Percentage Completion of engineering measurement step progress
WVe : Weight Value assigned to each engineering activities

## 9. PROCUREMENT PROGRESS

9.1 Weight Percentage for Each Discipline

Weight for each discipline is developed based on the sum of estimated price of the materials within the discipline as per example below:

pencapaian progress milestone Dokumen Utama Engineering) adalah sebagai berikut:

$$Ep = \Sigma (PCe * WVe) / \Sigma (WVe)$$

Note:
Ep : Progress Engineering (%)
PCe : Persentase penyelesaian tahapan engineering
WVe : Nilai Bobot yang sudah ditentukan untuk setiap aktivitas Engineering.

## 9. PROGRESS PENGADAAN

9.1 Persentase Bobot untuk Setiap Disiplin

Bobot untuk setiap disiplin dibuat berdasarkan jumlah perkiraan harga untuk material dalam disiplin tersebut sebagai contoh di bawah :

| **Discipline** *Disiplin* | **Weight in Procurement (%)** *Bobot Procurement* |
|---|---|
| Steel Structure | Based on Calculation *sesuai perhitungan* |
| Static | |
| Combustion | |
| Package | |
| Rotary | |
| Piping | |
| Instrument | |
| Electrical | |
| Overall | 100% |

Weight Percentage Calculation for each discipline

$$Wve\ disc\ (\%) = \frac{\text{Total Cost per Discipline}}{\text{Total Cost Procurement}}$$

Example Weight Percentage Calculation:

- Total Cost for all equipment in Piping Discipline = 150,000 USD.
- Total Cost all Material Procurement = 1,000,000,000 USD

$$Wve\ discipline\ (\%) = \frac{150.000}{1.000.000.000} = 0.015\%$$

Perhitungan Persentase bobot untuk disiplin

$$Wve\ disc\ (\%) = \frac{\text{Total Cost per Disiplin}}{\text{Total Cost Procurement}}$$

Contoh Perhtungan Persentase bobot:

- *Total Cost* untuk seluruh equipment di Discipline Piping = 150.000 USD.
- *Total Cost* seluruh Material Procurement = 1.000.000.000 USD.

$$Wve\ discipline\ (\%) = \frac{150.000}{1.000.000.000} = 0{,}015\%$$

Weight Percentage Calculation for each procurement item per discipline:

$$Wvp\ (\%) = \frac{\text{Cost per item Procurement}}{\text{Total Cost Proc. per discipline}}$$

Perhitungan Persentase bobot untuk setiap item procurement setiap disiplin:

$$Wvp\ (\%) = \frac{\text{Cost per item Procurement}}{\text{Total Cost Proc. per discipline}}$$

Procurement progress will be measured by weighting each purchase order on the allocated estimated cost against it and monitoring progress from a series of progress following milestones. Equipment/Materials Procurement milestones progress achievement:

Progress Procurement akan diukur berdasarkan bobot dari setiap purchase order dengan perbandingan estimasi biaya dan progress monitoring dari setiap milestone adalah tidak terbatas pada milestone sebagai berikut:

| Milestone | Cummulative Progress |
|---|---|
| Purchase Order | 8% - 12% |
| Key Vendor Data | 15% - 25% |
| Major Material Receiving | 25% - 35% |
| Interim Inspection | 35% - 45% |
| FOB or ready for shipment | 45% - 55% |
| Material on site | 85% - 95% |
| Final Document | 100% |

If any step or milestone not fulfilled for some reasons, Progress measurement conducted in the next step with cumulative progress percentage same as the achieved milestone.
Milestone / step progress above will be proposed by CONTRACTOR for OWNER approval.

Apabila ada *milestone* atau tahapan Procurement di atas tidak dapat terpenuhi karena suatu alasan, pemrogresan dilakukan pada tahapan berikutnya sesuai dengan progress kumulatif yang tercapai.
Tahapan progress diatas akan diajukan oleh KONTRAKTOR untuk mendapatkan persetujuan dari PEMILIK.

If any addition or deletion of materials, CONTRACTOR shall propose re-allocation weight of each material, with back-up or supporting document for OWNER review before implemented.

Dalam hal terdapat penambahan atau pengurangan jumlah material, KONTRAKTOR harus menyampaikan re-alokasi bobot dari setiap material termasuk backup atau dokumen pendukung kepada PEMILIK sebelum diimplementasikan.

The key steps for re-allocation weight distribution are summarized below:

a. Cancelled materials are deleted from progress calculation.

Langkah utama dalam re-alokasi distribusi bobot adalah sebagai berikut:

a. Material yang dibatalkan dihapus dari kalkulasi progress.

b. Addition materials are added to progress calculation.
c. The materials weight of the cancelled or added materials are distributed to the other materials in the same discipline.
d. Adjust the weight for other materials within same discipline, therefore with the addition or deletion of materials, the total weight for all materials remain 100%.
e. The weight % of each Discipline total is maintained.

9.2 Procurement Progress Back-Up Document Milestone achievement for Progress Procurement Shall be supported by document. Example of supporting document for the purpose of progress measurement, shown in the table below:

b. Material tambahan untuk ditambahkan ke kalkulasi progress.
c. Bobot Material yang dihapus atau ditambahkan untuk didistribusikan ke Material lainnya dalam disiplin yang sama.
d. Menyesuaikan bobot untuk Material lainnya dalam disiplin yang sama sehingga dengan adanya penambahan dan pengurangan material, total bobot untuk seluruh material tetap 100%.
e. Persentasi bobot dari setiap disiplin perlu dipertahankan.

9.2 Dokumen Back-Up Progress Procurement Pencapaian milestone untuk perhitungan progress procurement harus didukung oleh dokumen pendukung. Contoh supporting dokumen untuk keperluan perhitungan kemajuan pekerjaan dicontohkan pada tabel dibawah:

| Milestone | Example Supporting Document |
|---|---|
| Purchase Order | Un-price copy PO issuance |
| Key Vendor Data | - GA Drawing<br>- Specification |
| Major Material Receiving | Receiving Inspection |
| Interim Inspection | - Hydrotest Certificate<br>- Pneumatic Test Certificate |
| FOB or ready to Shipment | - Shipping invoice<br>- Packing List<br>- Bill of Lading (for import item only)<br>- Inspection Release Certificate (IRC)<br>- Final Shipping Notification (Only final shipment)<br>- Shipping Authorization & Shipping Advise<br>- Delivery Notes with Cargo Receipt stamp |

| | |
|---|---|
| Material on site | - Receiving Inspection Certificate (RIC) signed by OWNER (with no issues remark note) |

9.3 Procurement Progress Calculation Methode

9.3.1 Progress Calculation Methodes for Procurement per item.
Procurement progress of each item is calculated based on milestone achievement (Pcp).

9.3.2 Progress Calculation Methodes for Procurement per Discipline
The following is procurement progress calculation formula for each discipline

Pve = Σ (PCp * WVp) / Σ (WVp)

Note :
Pve : Procurement Progress per Discipline (%).
PCp : Percentage milestone completion per item
WVp : Weight value for each procurement item per discipline

9.3.3 Progress Calculation Methodes for Procurement
The following is procurement progress calculation

Pv = Σ (Pve * WVe)

Note :
Pv : Procurement Progress (%).
Pve : Procurement Progress per Discipline (%).
WVe : Weight value for each procurement discipline

9.3 Metode Kalkulasi Progress Procurement

9.3.1 Metode Kalkulasi Progress Procurement per item.
Progress Procurement untuk setiap item dihitung berdasarkan pencapaian *milestone* (Pcp).

9.3.2 Metode Kalkulasi Progress Procurement per Discpline
Berikut ini adalah formula untuk kalkulasi progress procurement per disiplin

Catatan :
Pve : Progress Procurement per disipline (%).
PCp : Persentase penyelesaian milestone Procurement per item
WVp : Nilai Bobot yang sudah ditentukan untuk setiap item procurement per disiplin

9.3.3 Metode Kalkulasi Progres Procurement
Berikut ini adalah formula untuk kalkulasi progress procurement

Catatan :
Pv : Progress Procurement (%).
Pve : Progress Procurement per disipline (%).
WVe : Nilai Bobot yang sudah ditentukan untuk setiap disiplin Procurement.