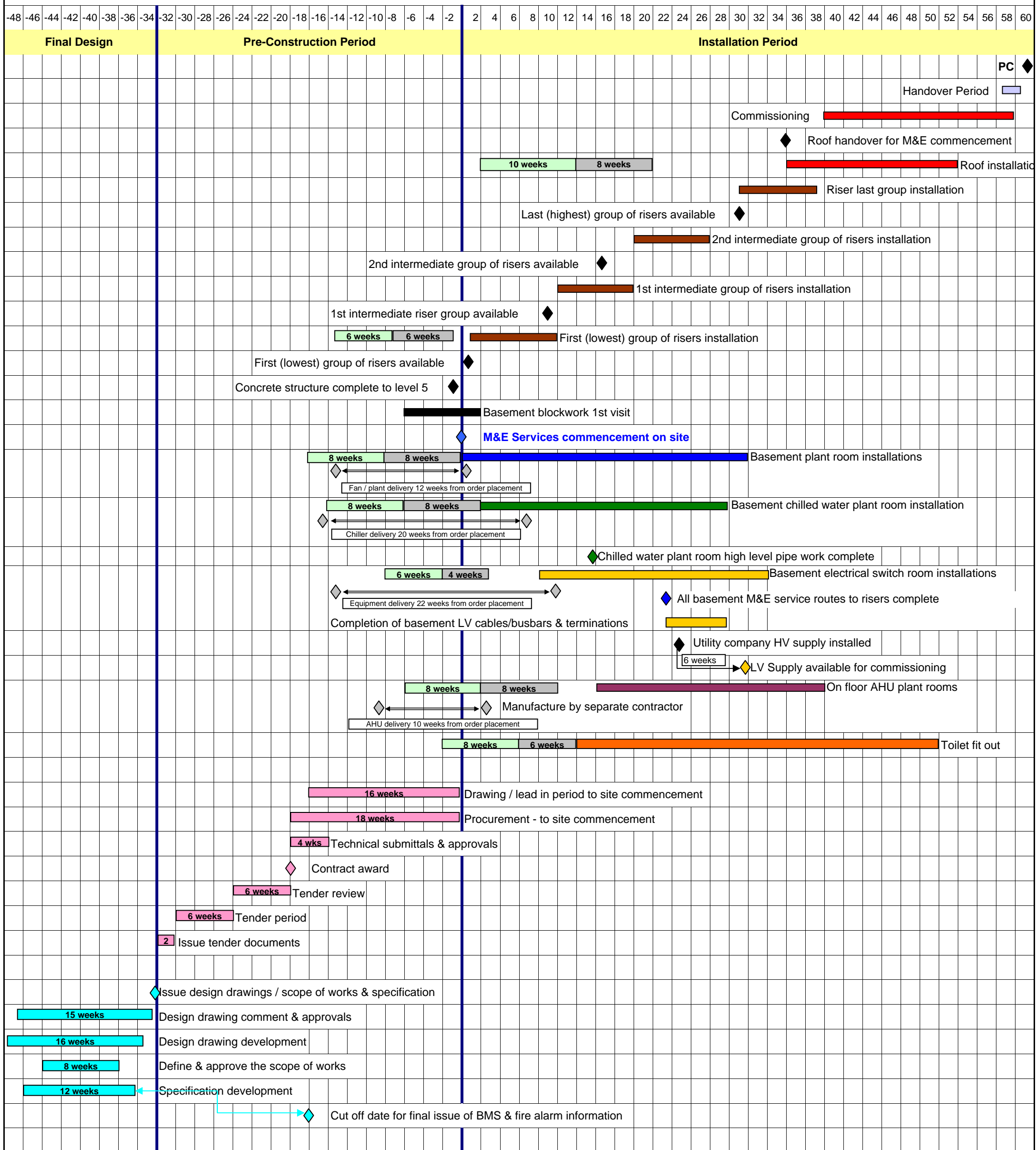


█ Remaining Work      ◆ Milestone  
█ Critical Remaining Work      ◆ Critical Remaining Milestone

**Assumptions:** 1) Half of the building is fed basement up, the other half is fed roof down. 2) There are major plant rooms at the basement and roof levels. 3) The cooling towers are located on the roof. 3) The riser shafts are not cast in concrete so there is a phased handover sequence with drylining. 4) The roof levels are handed over late so the installation will be concurrent with low level commissioning, consequently there will only be 7 weeks to finally commission the project.

### High-Rise Shell & Core Commercial Building M&E Services Overview



**KEY:**

	Drawing periods to 1st area commencement
	Manufacture lead in periods to 1st delivery
	Key plant item lead in from order
	Known construction deliverables

**TYPICAL CO-ORDINATED DRAWING SEQUENCE**

	Receipt of design information
	Co-ordinated Services Drawings (CSD)
	CSD Approvals / re-submittals
	Builder's work drawings
	Shop drawings / approvals
	6 to 8 weeks

## Narrative for the High-Rise Shell &amp; Core Commercial Building M&amp;E Services Overview

<b>Assumptions</b>	Assumptions: 1) Half of the building is fed basement up, the other half is fed roof down. 2) There are major plant rooms at the basement and roof levels. 3) The cooling towers are located on the roof. 3) The riser shafts are not cast in concrete so there is a phased handover sequence with drylining. 4) The roof levels are handed over late so the installation will be concurrent with low level commissioning, consequently there will only be 7 weeks to finally commission the project.
<b>PC &amp; handover</b>	Dates that will not change.
<b>Commissioning</b>	The actual period will be determined by area completion & power availability.
	The duration needs to be around 20 weeks - although the period from the roof mechanical pipe work completion is the most critical.
<b>Roof handover</b>	Roof handover is not the completion of the roof slab, it is the availability for meaningful commencement following roof finishes and blockwork (this applies to all areas).
	Ideally this should be around 6 months prior to PC (15-18 weeks installation period). It is worthwhile considering the purchase of acceleration periods of 1-3 weeks for potential late handover of the roof during the negotiation of award with the contractors.
	Releases could be sectional and plant positioning could be earlier.
<b>Roof installation</b>	You don't want to be standing in the roof plant rooms gazing down empty M&E risers, if this is the case there is trouble ahead.
	The key item for completion here is the mechanical chilled & condenser water pipe work completion, as this will release these systems for flushing.
	Roof works are always most critical when the cooling towers are located at the highest level, because final commissioning of all plant requiring cooling can not commence until these have been installed piped/connected and commissioned.
	This area will need to be closely monitored as it will become the most critical area of the project.
<b>Risers</b>	Risers should be released in groups of not less than 4 floors taking account of temporary and permanent watertight integrity.
	Riser programme activities should be supplemented by detailed formatted spreadsheets. These will provide instant graphical review for senior management and will decrease the number of repetitive programme activities as these can be replaced by summary activities.
	Service breaks could determine the riser grouping (bottom up & top down feeding).
	The highest group of risers should be released about 2 weeks after completion of the roof slab.
	The intermediate group levels should be released as they become available, any anomalies regarding late release need to be identified.
	There could be a situation whereby the release of particular risers are dependant on the construction and installation of services in others. This will manifest itself if one large consolidated hole has been left through the slab levels in order to expedite the vertical construction.
	If the risers are fully formed with the concrete structure the concrete structure will take longer to build but the overall time saving will be far greater.
	Basement risers could be incorporated within the basement works or inclusive within the 1st release group.
	The 1st group release should be about 1 or 2 weeks after the level 5 slab completion to allow for temporary waterproofing and any other enabling works.
	The lowest group release could also be the M&E services commencement on site date.
	The risers are the services links between the basement plant rooms, the on floor services and the roof plant rooms.
	Electrical busbars should not be installed until the riser is fully watertight.

**Narrative for the High-Rise Shell & Core Commercial Building M&E Services Overview**

<b>Basement blockwork 1st visit</b>	These should be built to full height with walls only left down for plant delivery access. Builder's work drawings need to be available for holes to be formed, which will allow access for fire stopping once the services have been installed.
	If walls are built only to a specific height (say 1 metre below the slab) with a view to completing them after the services have been installed will be a nightmare. Not only will the block layers not be able to gain access they will also destroy the services whilst attempting to do so.
	There would also be no access or storage for pallets of blocks, fork lift trucks, mixers or scaffolding.
<b>Basement plant room installations</b>	The main priorities are to establish and install the primary service routes between the plant rooms and the risers. A milestone should be incorporated to indicate the completion of this work.
	Key plant deliveries will be dependant on their technical approvals and manufacture lead in period.
<b>Chilled water plant room</b>	This should be identified as a separate area as it is generally double height and serves as a thoroughfare for other services.
	This will contain the main mechanical services installation.
	A milestone needs to be incorporated 12 weeks from commencement for completion of the high level pipe work, which will then release the area for subsequent trades.
	Mechanical trades tend to take their labour from this area to furnish other areas as they become available rather than increase their labour as required. This will usually occur around the time that the on floor plant rooms are available for their commencement.
	Overall the chilled water plant room installation can take around 6 months.
	Mechanical commissioning cannot commence until the pipe work in this room is fully complete.
<b>Electrical switch rooms</b>	The main priorities are to establish and install the primary service routes between the switch rooms and the risers.
	The electrical works will follow the ventilation, mechanical and public health installations as it is always the lowest service in a co-ordinated sequence.
	The installation of LV cables should not commence until the containment is fully complete.
<b>Utility company HV supply installed</b>	Power on to the building - Generally dictated by the infrastructure and the availability needs to be taken into account regarding the PC date. Other utility connections would be required prior to commissioning.
	This certainly needs to be available prior to commissioning commencement.
	Temporary supplies are not a suitable substitute to permanent commissioning power
<b>LV supply available</b>	Once the incoming HV supply has been made available a period of 6 weeks needs to be allowed for the completion of installations & testing prior to power being available for commissioning.
	Even if everything was 100% complete when the HV supply was available (which is extremely unlikely) everything cannot be tested at the same time.
	The commissioning would commence with the basement services, as the roof installation will still be progressing at this point and not available for commissioning.
<b>AHU plant rooms</b>	The AHU's are likely to be positioned prior to work commencement.
	The ventilation and mechanical risers should be installed prior to commencement.
	This work will run concurrently with the basement and then the roof installations.
<b>Toilet fit out</b>	Does not really tie in with the above works other than being fraught with its own problems it will run concurrently with most of the other works and be a drain on management and resources.
	<b>The Drawing Process</b>
	The M&E contractors should all commence the drawing process at the same time. At least this should apply to the mechanical/public health, ventilation, fire protection & electrical contractors. Therefore it is important that the M&E contracts are awarded at the same time.

**Narrative for the High-Rise Shell & Core Commercial Building M&E Services Overview**

	<p>Agreed zones can be left for fire alarm, CCTV/access control, IT &amp; BMS contractors - it is likely that the electrical contractor will install the primary route containment for these contractors.</p>
	<p>It is important that the co-ordinated drawing sequence (CSD) is agreed during the award process and each contractor submits their resourced drawing programme (all contractors drawing programmes need to concur).</p>
	<p>Release of builder's work drawings are essential for hole dimensions in blockwork walls.</p>
	<p>If 3D modelling is going to be utilised for drawings then all relevant technical submittals will have to be approved prior to commencement of the 3D model development for each area.</p>
	<p>The contractor's drawing programmes should indicate which resources will draw specific areas. It is important that they maintain the drawing process based on the start and finish dates and not their resources. The contractors should provide additional resources to maintain the programme sequence.</p>
	<p>Prefabricated ventilation ducting and mechanical pipe work generally will not commence until the contractor's shop drawings have been approved.</p>