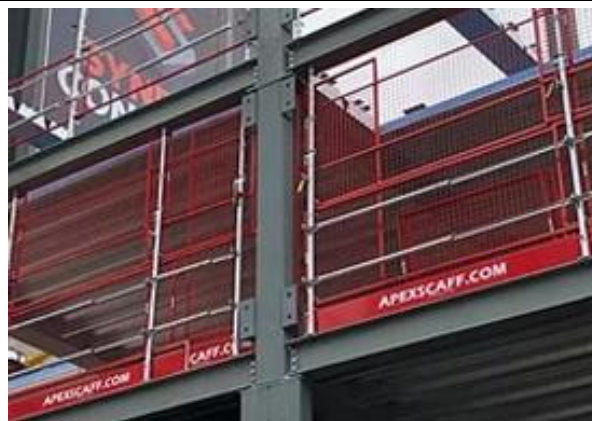


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GMR 4.2	Fall of Material/Object	
Description: These critical controls and performance standards apply to events caused by work from an edge of a floor not fully enclosed, inadequate design or installation, high wind, work outside edge protection, inappropriate storage of items, disturbance or demolition leading to a falling object and/or failure of a load. This event is inclusive of works on penetrations/voids, MEWPs, building maintenance works, temporary working platforms (scaffold), demolition, deconstruction, abatement or structural alteration works where the potential for material or objects to fall has been identified. Note: GMRs 4.6 crane and hoisting equipment incident and 4.17 failure of fixtures or fittings address related events. <i>All applicable local, national and international environment, health and safety legislation and recognised codes, standards and other external requirements must always be complied with. Where there is a difference between Lendlease Standards and those required by legislation recognised codes, standards and other external requirements the higher standard must be applied.</i>		
GMR Subsection:	4.2.1	Enclosure of Work Areas
Controls: Elevated work areas, including stair towers, must be enclosed with robust containment material to prevent a fall of material impacting people below. Performance Standards: i) Perimeter protection addressing the fall of person risk must also address the fall of material risk posed by stored or handled tools, materials, objects or equipment to prevent these from being kicked, knocked or bumped through openings or gaps. ii) Any means of containment enclosure must address risks posed by the lateral movement of the largest (weight) and smallest (dimension) items used within any permanent and temporary enclosures. Any enclosure solutions must be installed prior to further work being conducted. iii) The fall of material risk associated with temporary voids, penetrations, openings or gaps must be managed. Covers must be designed and securely fastened with warning signage displayed. Covers must be able to sustain the largest weight and prevent penetration by the smallest object. iv) For all vertical progressive construction, full height (floor to soffit) edge containment protection must be deployed and in place on multi-storey structures under construction prior to the installation of the facade or permanently designed edge protection solutions. For all auxiliary elements (e.g. scaffolds, hoists, MEWPs, perimeter screens or climbing formwork) a strict 'no gaps' policy must be adopted for both horizontal and vertical gaps. Designed solutions relative to these scenarios must be deployed and maintained to prevent the fall of tools, equipment and materials at all times (e.g. fully boarded out platforms, rubber seals, proprietary engineered hinged flaps and appropriately designed mesh).		
General Requirements		
Methodology		
Where any works could result in a fall of equipment, materials or tools which could cause injury, measures must be taken to prevent the fall, reduce the distance of the fall and/or ensure nobody could be struck if they do fall.		
Delivery		
- Physical barriers must be installed to prevent materials or equipment falling (for example posts fitted onto trucks during unloading of steel beams, wheel stops installed at slab edges where MEWPs are operating). - Exclusion zones must be established below or around all areas where there is a risk of persons being struck by falling materials (e.g. below works on the cladding of a building, around mobile crane works and loading/unloading activities, atriums, MEWPs). - All materials that could be blown or swept off from roofs, exposed floors or scaffolds must be removed or effectively secured when they are not being used, when work has ceased and/or when high winds are predicted.		

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Examples of enclosures provided for work areas to prevent fall of persons and materials



Gaps between climbing screen and construction floor sealed to comply with Lendlease's "No Gap" policy



Screen panels arrive pre-assembled with rubber gaskets installed, ready to lift in place



Gaps on work platform foam sealed to prevent materials from falling through

GMR Subsection: 4.2.2 Tool and Equipment Tethers/Lanyards

Controls: Tethers or lanyards must be used where the work area at height is not fully enclosed, or where tools or objects are required for use outside of the perimeter protection.

Performance Standards:

- Identify scenarios where tools or objects are required to be used outside of an enclosed work area and prescribe associated controls.
- A tether or lanyard must be used to separately secure each individual tool or object in use beyond any form of edge protection or enclosure. The object must be secured prior to crossing through the edge protection or enclosure.

ASIA APPLICATION STANDARDS

- iii) Each tether or lanyard and its sub-components securing an object beyond the encapsulation must be fit for purpose and manufactured to resist the falling object's forces.

General Requirements

Methodology

1. The work and scenarios where fallen objects could possibly happen must be identified and mitigated.

Delivery

1. Tethers must be used to tie-off any tools or equipment being used outside of any edge protection.
2. Hand tools used at height that may be a potential fall hazard must be adequately secured by a lanyard to the worker's wrist, tool belt or other suitable anchor means.
3. The means of anchor shall be assessed depending on the weight and size of the hand tool.



Lanyards/tethers for hand tools



Tool tethering options



Hand tool lanyards secured to wrist

GMR Subsection: 4.2.3 Wind and Toppling Exposure

Controls: All objects that are not fixed and could topple or be blown or uplifted from any location must be relocated to an unexposed area or secured appropriately.

Performance Standards:

- i) Stored materials, temporary barriers, fencing and signage must be assessed for the risk of toppling through assessing appropriate storage locations for the relevant material type. Consideration must be given to storage heights, equipment racks, exclusion zones, and the suitability of materials used to keep stored loads or materials stable. Risks of toppling from wind, vibration, or impacts from people, plant or equipment must be used to determine the appropriateness of any storage location and methodology.
- ii) Storage solutions for large items that have been assessed as presenting a toppling risk (e.g. trusses, large glazing panels, heavy equipment with a height to base ratio of greater than 3 to1) shall be reviewed by an engineer.
- iii) All operations must have information available relating to maximum wind gusts and the placement of objects, either temporary or permanent, and must consider the risk of objects being blown or uplifted by wind from any elevated position. Provide early weather warning systems for operations where there is the risk of windblown falls of materials.

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- iv) All objects that could be blown from elevated positions must be firmly fixed, secured or relocated to a less exposed area.
- v) Provide protocols to cease work activity at height when wind thresholds are exceeded, with protocols inclusive of the need to monitor components located at height such as any pulleys, guide rollers, swing gates or maintenance units.
- vi) Activities and equipment that can release materials from height (e.g. spoil from piling operations) must be assessed with physical controls on the equipment or exclusion zones in place.

General Requirements

Methodology

1. The amount of materials stored at roof level must be controlled to minimise the risk of materials being blown from height.
2. All roofing materials, plant and equipment, etc. must be stored and positioned in a way that they cannot fall or be blown off the roof structure.
3. Any materials or plant stored on the roof and which could be dislodged by work activities must be secured to prevent them falling. Items positioned close to any edge or opening require special consideration.
4. Materials, temporary barriers, fencing and signage must also be assessed for risk of toppling due to wind, vibration, or impact from people, plant or equipment.
5. Other structures or equipment with toppling risks – trusses, large glazing panels, heavy equipment with a height-to-base ratio greater than 3 to 1 shall be assessed by an engineer to determine their stability and suitable storage methods.
6. Wind speeds must be regularly monitored by the relevant Contractor and Lendlease personnel while activity is underway, along with the forecast wind conditions and any weather alerts issued.
7. When actual or forecast high winds are experienced it is imperative that construction and packaging materials that could be blown off the building is securely fastened and weighed down where possible.
8. A process to pro-actively monitor weather forecasts on a regular basis and take action as appropriate must be in place.
9. Where local climatic conditions dictate (i.e. where electrical storms occur regularly), operations shall have a system in place to monitor the proximity of an electrical storm and then alert workers accordingly.

Delivery

1. When adverse weather conditions are expected, all workers and contractors must be advised as part of the daily pre-start safety briefing.
2. Local offices must ensure all operations are alerted when severe weather is expected. Operations must then ensure the following actions are undertaken as a minimum:
 - All loose materials are secured down and removed away from exposed edges. This includes materials stored on roofs and at ground level where winds may lift board materials, resulting in injuries.
 - Rubbish is cleared up into containers or skips as the works progress, and skips are sheeted to prevent rubbish being blown away.
 - Operations are suspended where risks are increased due to the expected high winds, e.g. Hoists /Tower or mobile cranes/MEWPs.
 - Scaffolds are checked for adequate ties; loose materials and claddings.
 - All hoardings including temporary fencing and external signage are checked for stability.
 - Doors are secured or controlled where they can be blown open by the wind.
 - Broken glass panels are removed shortly after any incident and adequate suitable protection is put in place.
3. It is essential all material, particularly sheet material is secured to prevent it being accidentally blown off structures and scaffolds or across the site. This equally applies to sheet material stored at ground level on exposed sites.
4. An essential part of roof work supervision is the final check on the storage arrangements at the end of each shift. This is particularly important when inclement weather is imminent. At the end of each day's activity any materials that could be blown off the building overnight needs to be either fastened or stored in a suitable area away from the building edge. The item(s) can then be either secured if still exposed to the elements, or stored in an enclosed area.

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Monitoring and Alert Guide for Electrical Storms

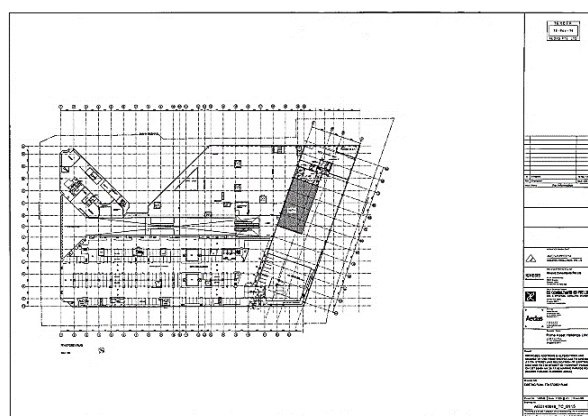
Note: This is a guide, and the manufacturer's instructions and local regulatory guidelines must always be consulted.

<u>MILES</u>	<u>KM</u>	<u>ACTION</u>
0 – 3	0 – 4.8	RED - All works to stop
3 – 8	4.8 – 12.8	AMBER – Crane operations and all works at height to stop
8 – 20	12.8 – 32.18	To monitor

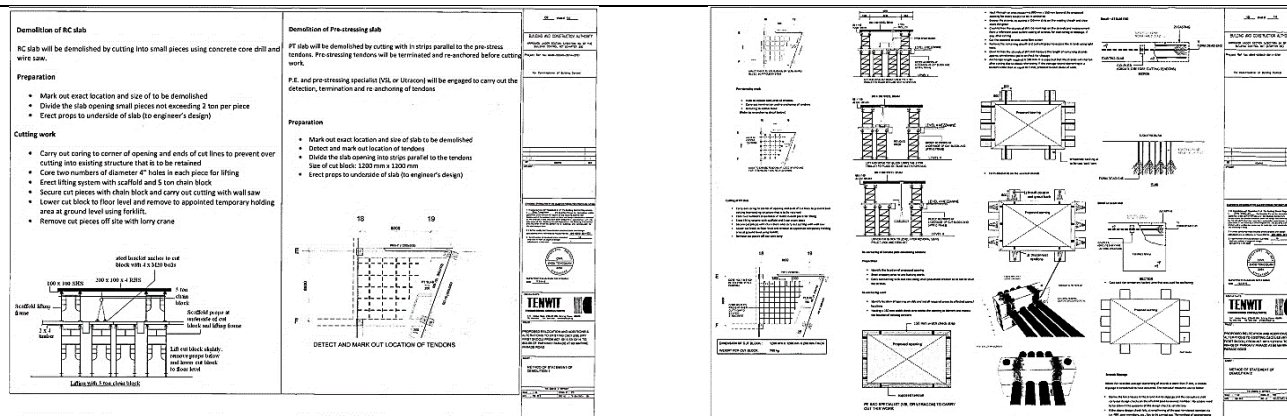
- i) All structural alteration work or structural change work must have a building and services survey completed by a qualified and registered structural engineer to determine the sequence of works and assess the risk of failure of structure or fall of material.
- ii) In the event of any proposed changes to the planned activity or sequence, a documented review must be completed to assess how the structural alterations could be affected.

1. Prior to structural alteration works commencing, a detailed building and services survey must be undertaken by a registered structural engineer to ascertain the structural integrity of the building and any presence of services that may impact the rectification works.
2. The results of the survey shall be documented and the information used for the safe planning, sequencing and undertaking of the alteration works. Risks of failure of structure or fall of material must be assessed.
3. All structural rectification or alteration works must be designed and endorsed by a registered structural engineer.

1. The structural alterations work shall be closely monitored to prevent deviation from the planned sequence.
2. Any change in the loading conditions of the structure must be reviewed by the registered structural engineer to ensure safe execution of the works.

[illegible]

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Example of plans prepared, reviewed and endorsed prior to structural alteration works commencing

GMR Subsection: 4.2.5 Exclusion Zones

Controls: An adequate exclusion zone must be in place whenever overhead work has the potential for tools, materials, objects or equipment to fall.

Performance Standards:

- Exclusion zones must be established below or around all areas where there is a risk of people being struck by falling materials (e.g. below works on the cladding of a building, around mobile crane works, loading/unloading activities, atriums and MEWPs in use).
- Exclusion zones must be of adequate size, take into account the risks such as potential arc of fall, deflections and bounce distances, be delineated by physical barriers and have clear signage prohibiting unauthorised entry. The integrity of any exclusion zones must be regularly checked.
- Under no circumstance may a person enter an exclusion zone whilst work is being carried out overhead.

General Requirements

Methodology

- Wherever there is a risk of a fall of materials, tools or equipment due to the potential failure of a primary control measure, effective exclusion zones and/or other suitable secondary control measures that provide full protection must be deployed.
Note: Works involving the use of MAS/MEWP shall be included in this clause and shall have effective exclusion zones implemented.
- Each operation must develop a standard identifying what barricade material will be used and standard signage considering both internal and external works. No operation shall identify more than three standard exclusion zone types to be used. This must be documented and recorded in the Height Mitigation Plan.
- Whenever construction activities impact near or over a public interface, full and robust hard protection means AND/OR effective exclusion zones must be implemented to prevent unauthorised entry and ensure public safety is not compromised.
- Exclusion zones must be set up before works at height commence and be of adequate size to prevent danger to workers and the public. Risk assessments undertaken shall consider the following issues:
 - The height from which material may fall
 - The nature of the material that may fall
 - Bounce effect that may occur from the falling material
 - Sail effect that can occur as a result of wind
 - Available space
- Planning and communication processes must be in place to ensure the following:
 - The expected standards for exclusion zones are clearly communicated to the supply chain during procurement.
 - SWMS/pre-task plans for work at heights are reviewed to include the provision of exclusion zones.
 - Exclusion zone requirements and standards are being effectively communicated to trade supervisors and workers.
 - Exclusion zones are being verified as in place prior to work at height commencing.

Delivery

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1. Exclusion zone areas shall be totally enclosed and delineated by robust physical barriers to prevent unauthorised access and have adequate clear signage to warn people of the hazards of falling materials.
2. Hazard warning tape is not acceptable as a means of demarcating and preventing unauthorised entry into exclusion zones. Cones/chain and bars can only be used for lightweight low-risk internal scissor lift operations.
3. Adequate numbers of spotters/marshals shall be employed to monitor and maintain the integrity of the exclusion zone, and ensure unauthorised access does not occur. Spotters/marshals must have received clear instruction and training on their role.



Exclusion zone established with hard barricades, safety mesh and signage, and large enough to accommodate the height from which material may fall.



Collective exclusion zones in the form of robust guardrails with netting plus bollards and planks extending far enough and with visible signage.



Solid fenced barriers used to provide robust exclusion zones



Exclusion zone established around lifting machine

GMR Subsection: 4.2.6 Secondary Protection or Catch Measures

Controls: Overhead protection must be installed where the risk of falling objects exists and wherever a public interface on site exists.

Performance Standards:

- i) Identify in construction and asset works any scenarios where overhead protection must be installed, particularly where an engineering control preventing the fall of material cannot be implemented, people below cannot be completely excluded, enclosure or tether/lanyard requirements cannot be met, or where an object's mass, positioning or height from next floor level could cause a fatal injury if it fell onto a person.
- ii) For all structural work on any vertical progressive multi-storey construction, a secondary catch system (e.g. a diaper net, catch fan, horizontally projecting net or any other structurally designed element) must be positioned immediately below any areas where this work is being undertaken above (e.g. at the level just below the screens) and the application must consider the arc of any potential fall of material.
- iii) Where there is the potential for members of the public and/or workers to be impacted by a fall of material, a designed and engineered overhead protection (e.g. crash deck) must be appropriately positioned and of adequate strength and coverage taking into account potential material types and the arc of any potential fall of material.
- iv) Overhead protection or catch systems must be designed to avoid failure due to impact with the object it will intercept as a result of over spilling, puncture holes, melting by hot objects, corrosion or overload by weather events (e.g. seasonal maximum wind, rain, hail or snow).

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- v) Provide details of how the safe retrieval of a fallen object from overhead protection or catch systems will be achieved.

General Requirements

Methodology

1. All designated access points to the building are to offer adequate overhead protection.
2. Overhead protection and catch nets must be engineered to be capable of protecting those below. They shall be designed and endorsed by qualified, competent and experienced persons, i.e. qualified engineer.
3. This must be considered during the design stage as the engineering and construction techniques for erection and removal may lead to additional risks.
4. Protected walkways shall be designed and constructed in order that adequate protection from overhead hazards is achieved.
Note: A basic scaffold frame with a ply covering is NOT considered adequate.
5. The absolute minimum standard for walkways offering protection to personnel shall be an engineered solution of two 18mm sheets of ply firmly secured with steel mesh sandwiched in between. Heavy duty protection shall achieve 10kPa and light duty 5kPa.
6. All designated entry points to buildings under construction or passenger hoist waiting areas are to have adequate overhead protection provided.

Delivery

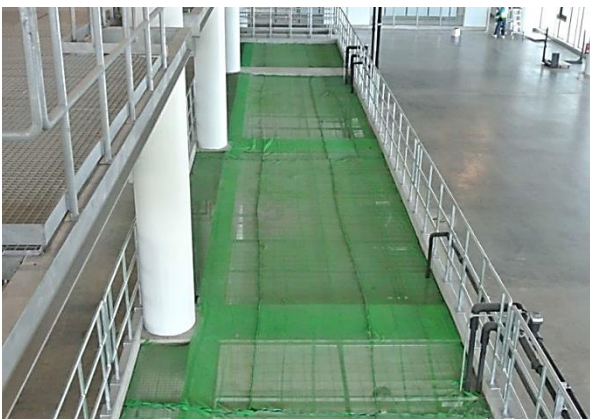
1. Working below an uncontrolled overhead risk of falling material is not permitted.
2. Catch net/decks shall be installed external to primary perimeter edge protection, immediately below construction or floor level of risk.



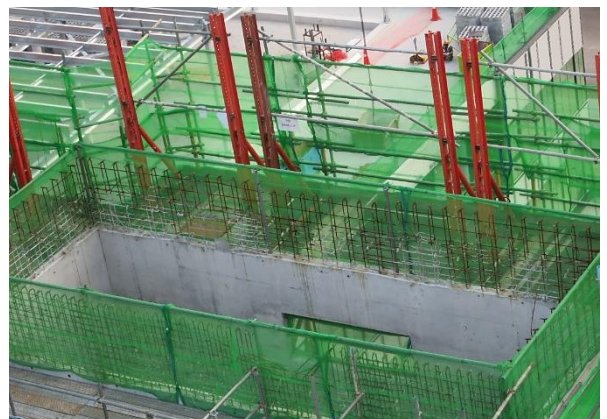
Overhead protection at designated access point of the building



Proprietary perimeter catch net system



Horizontal catch nets as a form of mitigating control for fall of materials



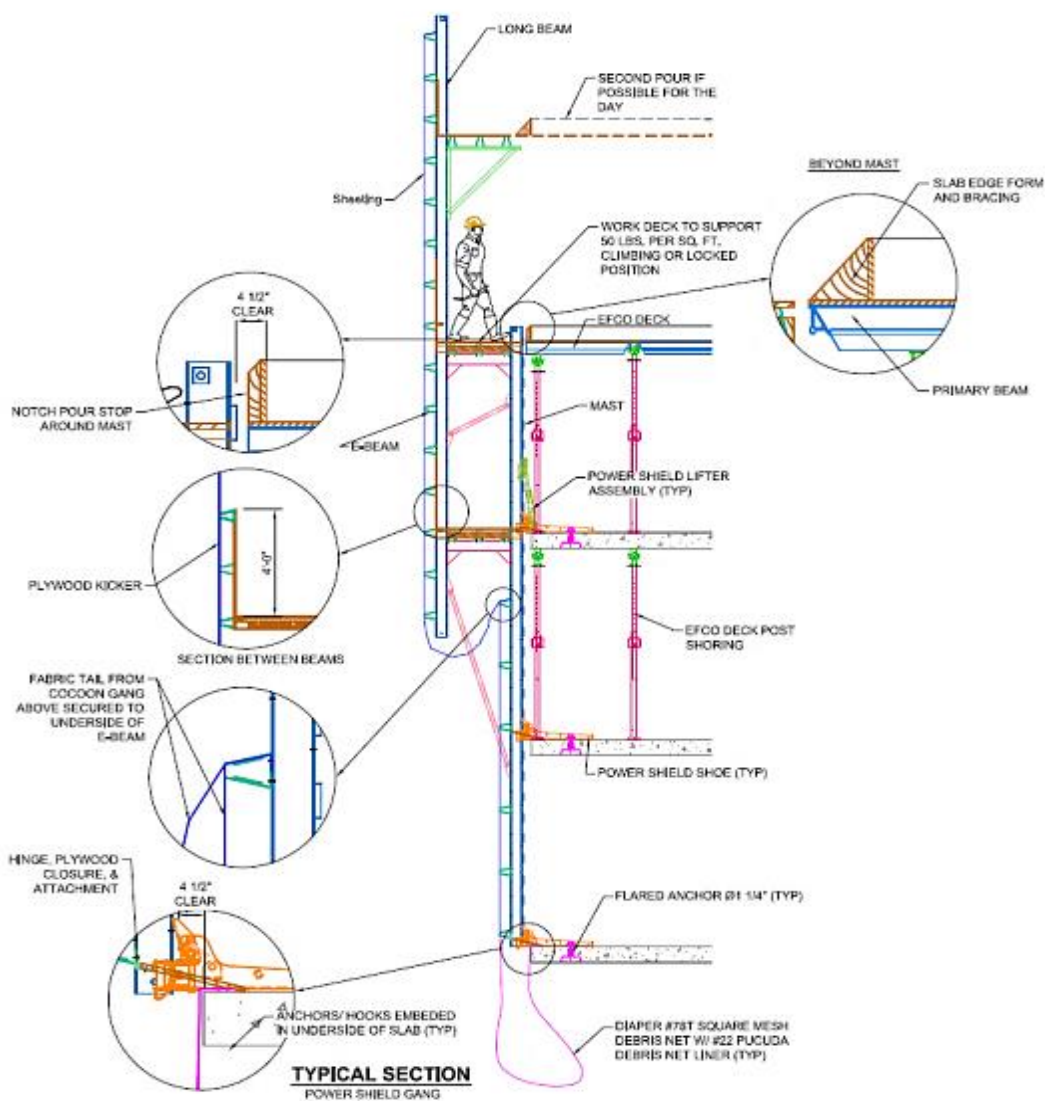
Vertical nets installed as a means to mitigate the fall of materials

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Protected walkways designed and constructed to provide adequate protection to the public from overhead hazards



Schematic drawing of a 'Diaper' System

Note:

- This Application Standards provide guidance that meets the GMR requirements.
- The requirements should be implemented across projects to ensure that projects comply with GMR and reduce risks associated with the works.
- If site conditions require changes to proposed standards, please consult your project EHS leads and/or Country EHS managers and/or Regional EHS team to confirm the intent of the GMRs are still met.

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