A globally recognised symbol of sustainable engineering

The GSAS system awards one of six levels of certifications to projects, from one star to six stars, depending on their environmental and social impact.

Assessment can be conducted to certify the project in the design, construction and operations phases.

Dr. Yousef Mohammed Alhorr, Founding Chairman
A MESSAGE FROM

Founding Chairman

GSAS Construction Management (GSAS-CM) scheme provides a system for assessing and rating the aspects of construction processes and practices at site and considering what impacts the contractors might mitigate during their construction activities of a project.

It is our endeavor that GSAS-CM certification does not only help to raise the standard of contractors’ processes and practices on sustainable management of construction site, but inculcates the culture of respecting, prioritizing and managing the sustainability aspects related to the construction project, through inclusive management approaches involving workers, supervisors, management and community at large. I would like to acknowledge the efforts and contributions from the State of Qatar, all our members, and international partners especially the University of Pennsylvania, USA and its associated consultants who helped establish GSAS and take it into new dimensions. Last but not least, the continuous support from Qatari Diar Real Estate Investment Company is highly appreciated, and without its support GSAS would not have been able to achieve what it has achieved in such a short time.

DR. YOUSEF MOHAMMED ALHORR,
FOUNDING CHAIRMAN

GORD has come a long way since pioneering the Global Sustainability Assessment System (GSAS), formerly known as (QSAS), the Middle East’s first integrated and performance-based green building assessment rating system originally established in 2009.

The primary goals of GSAS include creating a sustainable living environment, minimizing resource consumption and reducing environmental degradation due to the fast pace of urbanization taking place in this era. GSAS draws from top-tier global sustainability systems and adds new facets and dimensions to the current practices in assessing the sustainability of the built environment. Modelled on best practices from the most established global green building rating schemes including, but not limited to, BREEAM (United Kingdom), LEED (United States), GREEN GLOBES (Canada), CEPAS (Hong Kong), CASBEE (Japan), and the International SBTOOL, GSAS has grown into a pan-regional system offering a comprehensive framework, and equally flexible to incorporate the specific needs of the local context of different regions. In Qatar, GSAS is currently the only rating scheme to be acknowledged by Qatar Construction Specifications (QCS 2014).

GSAS Version 2.1 has become the most comprehensive system to date that addresses the built environment from the macro level to the micro level targeting a wide range of building typologies.
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• Ministry of Municipality & Environment (MME)  
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• Public Works Authority (ASHGHAL)  
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• Qatar General Electricity and Water (KAHRAMA)  
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SCOPE

Global Sustainability Assessment System (GSAS) is the first performance-based rating system in the MENA region. The primary objective of GSAS is to create a sustainable built environment, considering the specific needs and context of the region.

The objective of GSAS-Construction Management (GSAS-CM) scheme is to evaluate the sustainability impact of building or infrastructure project over the course of the construction phase. The scheme assesses the aspects of the construction processes and on-site practices of that have a lasting sustainability impact; and, provides framework to perform measurements in line with normative standards and accepted practices and to consider which impacts the project can mitigate.

GSAS-CM scheme is used to assess processes and practices of contractors in projects of construction of buildings, mixed use developments and districts & infrastructure; irrespective of whether GSAS Design & Build certification is pursued by these projects or not. The scheme benefits from best practices employed by the construction industry taking into consideration the specific ecological and environmental context of the region.

Although the GSAS-CM scheme can be used for different types of project using the same process and measurement principles, there may be differences among the project types depending upon different applicability of criteria at each construction stage (enabling / foundation stage; superstructure stage; and, finishing stage), types of measurements required within a particular criterion, and specific reference values or scoring thresholds. Since the assessment involves audits at each construction stage, the nature of observations in audit advisory notes issued at each stage will also differ from criterion to criterion.

GSAS-CM framework is based on eight categories including Urban Considerations [UC], Site [S], Energy [E], Water [W], Materials [M], Outdoor Environment [OE], Socio-Cultural Dimension [SD] and Management & Operations [MO]. The categories are then broken down into specific criteria that measure and define individual issues related to environmental aspects.

For a contractor it is possible to target selected categories and criteria to achieve desired GSAS star rating. In order to incorporate the targeted GSAS-CM framework categories and criteria and to outline how a construction project will plan human, organizational, and communication resources and processes to meet the requirements of targeted GSAS criteria, a GSAS Construction Management Plan (GSAS-CMP), shall be developed by contractor and assessed by GSAS-Trust.

Furthermore, appropriate submittals shall be made for assessment of evidence of compliance against each targeted GSAS criterion as guided by the CMP.
COMPLIANCE REQUIREMENTS

To fulfill the requirements of GSAS-CM scheme, following must be complied with.

1. Development and Submission of GSAS-CMP

GSAS-CMP shall be first developed and submitted by the contractor highlighting the targeted GSAS-CM categories and criteria, targeted final rating of GSAS-CM, and the management resources and processes required to meet the target. For a general outline on the plan, refer to the contents provided in “Part One: GSAS-CMP Guidelines & Assessment” section. An authorized GSAS-CM Service Provider is required to facilitate the signing off and delivery of the required GSAS-CMP.

Important Note: Submission of the contractor’s GSAS-CMP is a prerequisite for obtaining the GSAS-CM certificate. The final score for conforming to the requirements of this part will be granted based on the adequacy of the submittals in accordance with stipulated requirements of GSAS-CM manual. Failure to conform to this requirement may lead to denial of GSAS certification. Refer to the section “Part One: GSAS-CMP Guidelines & Assessment” for more details on these compliance requirements.

2. Submission for Assessment of Targeted GSAS-CM criteria

Contractor shall select targeted criteria to achieve desired GSAS star rating and will implement best practices in accordance with guidelines outlined under each criterion.

The submissions for assessment of GSAS-CM criteria, including documentation of evidences for evaluating the sustainability impacts of the construction processes and practices of contractor shall be provided as stipulated under the assessment section of each criterion.

GSAS Trust auditors will conduct the audits for the assessment of GSAS-CM criteria. During audits, auditors will also cross-check the implementation of the requirements of GSAS-CMP.

Should the targeted GSAS-CM categories/criteria or rating or the plan for resources or processes change, the GSAS-CMP should be promptly updated.

Refer to the section “Part Two: GSAS-CM Categories - Guidelines & Assessment” for more details on the compliance requirements.

The audits by GSAS Trust team/s for GSAS-CM certification are done for each of the three construction stages (enabling / foundation stage; superstructure stage; and, finishing stage). The audits are comprised of two parts:

1. **Desk review** of the submitted documents, required under Part-I and Part-II of GSAS-CM manual, for their completeness and compliance of the requirements;

2. **Site tours** for verification of implementation of requirements under each criteria and collection of evidences for the same.
GSAS-CM CATEGORIES AND CRITERIA

Eight categories of GSAS-CM address different aspects of the construction practices and outline the ways in which contractors can mitigate the negative sustainability effects. These categories are then broken down into specific criteria that define individual sustainability issues. Each criterion specifies a process for measuring parameters related to sustainability impact and for documenting the degree to which the requirements have been met. A score is then awarded to each criterion based on the degree of compliance.

General description of the categories is provided below.

**Urban Considerations [UC]**

The Urban Considerations category considers aspects related to traffic & transportation management, reclamation & dredging, and sewer & waterway contamination.

**Site [S]**

The Site category considers aspects related to land preservation, habitat preservation, erosion & sediment control, soil & earthworks control and groundwater & dewatering control.

**Energy [E]**

The Energy category considers the aspects related to energy management and CO₂ emissions reduction in contractor’s use of energy during construction.

**Water [W]**

The Water category considers aspects related to water management for domestic and not domestic applications.

**Materials [M]**

The Materials category considers aspects related to reuse, recycling and recovery of materials used for buildings or during construction works.

**Outdoor Environment [OE]**

The Outdoor Environment category considers aspects related to dust control, noise & vibration control, light pollution & visual impact control and odor & VOCs control.

**Socio-Cultural Dimension [SD]**

The Socio-Cultural Dimensions category considers the aspects associated with cultural conservation, protection of archeological or heritage sites and society engagement.

**Management & Operations [MO]**

The Management and Operations category considers aspects related to waste management, welfare facilities, construction health & safety and workers’ accommodation.
MEASUREMENT & SCORING

Scoring against many of the GSAS criteria is performance-based, which is justified by measurements of associated parameters. For some of the criteria, scoring is based on the qualitative indicators of implementation of best practices. The scoring is quantifiable on the scale of 0 to 3 (0, 1, 2 & 3 or 0, 1 & 3) depending on the criterion’s level of impact.

In GSAS Construction Management scheme, 0 refers to “evidence not acceptable” or “requirements not attained” and scores of 1 to 3 are levels of gradual improvements in sustainability of construction processes and practices.

Each category and criterion has an associated weight based on its relative environmental, social, and economic impact. Once a score is assigned to each criterion in the assessment system, the values are multiplied by the weight and a cumulative final score is determined. GSAS consists of six certification levels to measure the sustainability impact of contractor’s processes and practices on a specific project site. Certification can only be achieved when the final score is equal or greater than 0.5, earning a rating of 2, 3, 4, 5, or 6 stars. The minimum acceptable rating for construction project is 2 stars that it shall achieve corresponding to minimum score of 0.5. Whereas the highest rating applicable to a project is 6 stars that it can achieve by earning a score of 2.5 or more, subject to a maximum limit of 3.0 that is achievable in GSAS-CM scheme.

Important Notes

1. Incentive weights are allocated in certain GSAS-CM criteria to encourage additional efforts to implement best practices on sustainability.

2. If criteria under Site or Materials categories are targeted in GSAS Design & Build certification, the construction project can inherit the score as indicated in the awarded Letter of Conformance (LOC). This is subject to confirmation that the construction project meets the requirements for the inherited score.

3. Under GSAS-CM scheme, certification is denied: (i) if GSAS-CMP is not submitted or does not demonstrate compliance with the requirements; (ii) If the project score falls below 0.5.

4. For assigning scores for criteria that require the qualitative compliance of a submitted report, the report must demonstrate successful implementation of at least 80% of the measures included in the guidelines (and additional best practices, if any), taking into consideration the justified hierarchy of measures based on the significance of their sustainability impacts.

5. For obtaining GSAS-CM certification it is mandatory that a project targets some or all criteria from at least six categories. Failure to do this will result into denial of certification.
### Score | Certification Level | GSAS Certification
---|---|---
< 0.5 | - | Certification denied
0.5 ≤ X < 1.0 | ★★ | Certification denied
1.0 ≤ X < 1.5 | ★★★ | Certification achieved
1.5 ≤ X < 2.0 | ★★★★ | Certification achieved
2.0 ≤ X < 2.5 | ★★★★★ | Certification achieved
X ≥ 2.5 | ★★★★★★ | Certification achieved

Figure 1  Scoring levels of GSAS
COMPONENTS OF GSAS-CM SCHEME

The scheme is comprised of mainly two parts which are described hereinafter.

PART ONE: GSAS-CMP GUIDELINES & ASSESSMENT

This section provides guidance on the minimum requirements for developing a simple, consistent and effective GSAS-CMP for projects targeting GSAS-CM certification, as well as submittal required for its assessment by GSAS Trust. The scale, complexity and local environment of different projects will alter the coverage of issues and level of details required in a GSAS-CMP, however, the content of each GSAS-CMP must include all of the sections listed hereinafter.

[I] GUIDELINES FOR DEVELOPMENT OF GSAS-CMP

A) Purpose of GSAS-CMP

A GSAS-CMP is a site or project specific plan developed to incorporate the targeted GSAS-CM categories and criteria, targeted final GSAS-CM rating and to ensure that human, organizational, and communication resources and processes are in place to meet the requirements of the target. Furthermore, it demonstrates a commitment from contractor that the construction project will avoid, minimize or mitigate effects on the environment and surrounding area required as per the targeted categories and criteria of GSAS-CM.

B) Contractor’s Roles and Responsibilities

The roles and responsibilities of the contractor in relation to the development of GSAS-CMP include:

• Developing GSAS-CMP in consultation with the staff and sub-contractors teams.
• Managing the delivery of GSAS-CMP submissions.
• Updating GSAS-CMP if the targeted categories/criteria change and/or plans for resources/processes change.
• Providing complete and accurate information in GSAS-CMP.
• Communicating GSAS-CMP to all staffs and sub-contractors that play key roles for the successful delivery of the plan.
• Upholding the commitments of GSAS-CMP with utmost importance throughout the entire duration of the construction.
C) Contents of GSAS-CMP

This section describes the titles and contents of each section of GSAS-CMP.

Introduction

This section is important to understand contractor’s purpose to target GSAS certification and his commitment to sustainability.

In this section, identify:

- The purpose of the GSAS Construction Management certification and intended GSAS targeted rating;
- Any previously performed assessments such as Environmental Impact Assessment (EIA) or GSAS Design & Build-LOC;
- Key players - the parties that prepared the GSAS-CMP and will be responsible for implementing and updating it.

Project Description

This section will provide an overview of project activity and its location, the context of GSAS certification and a broad evaluation of value addition of GSAS in terms of sustainable development.

In this section, identify:

- Project background – briefly describe the building/infrastructure project that this particular construction activity relates to, including the major elements to be delivered under the GSAS-CMP;
- Project location – describe the location and include a site plan laying out the major activities/facilities/compounds proposed;
- Construction Activities - A description of the proposed works including:
  - A brief description of the major construction processes to be used;
  - Normal working hours;
  - Type, frequency and duration of works conducted outside working hours.
- Scheduling - include anticipated start and finish dates, including a break down by stages, if the project is to be constructed in a phased manner.
GSAS-CMP Scope

This section shall be written after careful evaluation of which GSAS-CM categories and criteria should be targeted based on broad evaluation of sustainability impact of practices and processes at construction site. This is a good starting point to seriously consider capacity and capabilities of contractor to mitigate sustainability impact associated with its site-specific activities pertaining to targeted criteria.

In this section, identify:

- GSAS-CM categories and criteria and final GSAS-CM rating targeted by the contractor;
- Which targeted GSAS-CM criteria may be affected due to previous GSAS Design & Build-LOC (if applicable); and,
- The objectives and scope of the GSAS-CMP for the project. For example, if activities will be conducted in separate phases, and the GSAS-CMP is being submitted only for one particular phase of the development, then this section should describe those activities which are to be addressed by this specific plan.

Human Resources Roles and Responsibilities

A good assessment of GSAS-CM categories and criteria will provide enough inputs to contractor on the skills, and experience of required human resources. The inputs will help to develop this section of GSAS-CMP.

In this section, provide:

- Human resources details (names and positions) for the sustainable management of the project in accordance with targeted GSAS categories, criteria and rating;
- Descriptions of the different roles and responsibilities undertaken by those people, pertaining to GSAS-CM implementation and monitoring throughout the construction phase;
- Descriptions of the roles and responsibilities as they apply for sub-contractors pertaining to GSAS-CM implementation and monitoring throughout the construction phase; and,

Training, Awareness and Competency

This section is important to analyze and improve the awareness, skills and competencies required at different levels of the team that is dedicated to GSAS-CM implementation and monitoring.

Imparting training and raising awareness is particularly important for several GSAS criteria where human intervention and performance hold very high significance from sustainability point of view. There criteria include: Energy Management; CO₂ Emissions; Water Management; Dust Control; Noise and Vibration Control; Waste Management; and, Construction Health and Safety. However, GSAS-CM scheme-wide topics need to be identified and awareness building and skill-based training should be encouraged.
Through project-wide awareness campaign, a behavioral change must be brought about in the staff by creating a culture that instills a sense of ownership and responsibility in them. For example staff should be aware and proactive in implementing best practices such as good housekeeping, optimum resource consumption, waste management, prevention and control measures in relation to different criteria indicated above. Specialized skill-based training needs for key personnel shall also be identified promptly, and appropriate trainings will be imparted accordingly.

In this section, identify:

- The trainings needed for developing skills, competencies and awareness that personnel working on site have received pertaining to environmental issues associated with targeted GSAS criteria;
- Modes, contents and extent of training for skill, competency and awareness building;
- The personnel responsible for ensuring that appropriate training plans are devised; and,
- The forms and formats to maintain the records that at a later stage will provide evidence on who undertook which training events on which dates and who conducted the training.

Sustainability training can take a variety of forms such as toolbox talks, meetings or more formal training. Following are some examples.

- A site induction
- Familiarization with the requirements of the GSAS-CMP
- Any specific training required for particular aspects of the project e.g. dust and noise management training for plant operators
- Familiarity with site environmental controls

Communication

This section is important from the point of view of managing internal and external communication on sustainability aspects pertaining to GSAS-CM.

In this section, identify and expand upon aspects of contractor’s corporate communication strategy relevant to GSAS certification such as:

- Internal communications;
- Toolbox meetings;
- Handling of external communications (incl. community liaison); and,
- Public complaints.

In all cases, identify the person/s responsible for coordinating inputs, outcomes and actions arising from these communications.
**Review & Reporting**

This section is important to describe what management framework including plans and controls are in place to ensure that GSAS-CM implementation is done effectively and efficiently.

In this section, describe how the GSAS-CMP will be reviewed depending upon the change in plan of deviation from targets. Any proposed change to the nature, extent or scope of activities included in the project will trigger a GSAS-CMP review and update. This section must take into consideration the following.

- Reviews must be undertaken when:
  
  (i) there is a change in project scope; or,
  
  (ii) an environmental incident affecting certification outcomes takes place; or,
  
  (iii) an improvement is identified through either onsite experience, or observation reported through site audits at different stages (enabling / foundation stage; superstructure stage; and, finishing stage) or;
  
  (iv) an improvement is identified through a change in industry best practice or standing legislation.

- Periodic reports should be prepared, covering compliance of construction activities with the established environmental plans for targeted GSAS-CM criteria.

- Changes required to GSAS-CMPs must be communicated to GSAS Trust prior to scheduled audit visits. During a review of each GSAS-CMP, GSAS Trust will evaluate the compliance of the GSAS-CMP provided by the contractor. The evaluation intends to ensure that the GSAS-CMP adheres to this guideline document and provides sufficient detail.
[II] ASSESSMENT OF GSAS-CMP

MEASUREMENT

Projects will develop a GSAS-CMP in accordance with the guidelines provided in section [I] above.

SUBMITTAL

Submit the GSAS-CMP including the recommended contents for the plan. Also provide the evidences and support documentation for the fulfillment of CMP requirements.

Following the submission of the GSAS-CMP, GSAS Trust officials will review the plan to verify whether all elements of the plan are complete and meet all of the stipulated requirements. GSAS Trust may require re-submission of the GSAS-CMP for approval where changes based on periodic reviews introduce new potential environmental impacts, alter the frequency or consequences of existing impacts or result in a significant environmental impact pertaining to targeted criteria.

SCORE

<table>
<thead>
<tr>
<th>Score</th>
<th>Requirements</th>
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<tr>
<td>Pre-requisite met</td>
<td>GSAS-CMP demonstrates compliance</td>
</tr>
<tr>
<td>GSAS Certification Denied</td>
<td>GSAS-CMP doesn’t demonstrate compliance</td>
</tr>
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</table>
PART TWO: GSAS-CM CATEGORIES – GUIDELINES & ASSESSMENT

GSAS Construction Management framework consists of eight categories each associated with a specific environmental aspect having potential environmental impact/s. The table below lists all categories and their associated criteria.

<table>
<thead>
<tr>
<th>No</th>
<th>Category</th>
<th>Weight</th>
<th>Incentive Weight</th>
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<td>UC</td>
<td>URBAN CONSIDERATIONS</td>
<td>7.00%</td>
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</tr>
<tr>
<td>UC.1</td>
<td>Traffic and Transportation Management</td>
<td>2.50%</td>
<td></td>
</tr>
<tr>
<td>UC.2</td>
<td>Sewer and Waterway Contamination</td>
<td>2.50%</td>
<td></td>
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The GSAS Construction Management manual provides necessary information for each topic starting by describing the purpose of criterion, followed by a comprehensive guideline and the assessment protocol according to the structure outlined below.

**PURPOSE** Outlines the intent of the criterion.

**[I] GUIDELINES** Provides requirements, recommendations, plans and best practices and processes to be developed and implemented by the contractors for the effective attainment of sustainability goals of the criterion. The guidelines are not exhaustive and in certain cases provide best practice examples, therefore additional best practices can be implemented by the contractor to attain desired score targeted criteria.

**[II] ASSESSMENT** Provides the measurement requirements the project must meet, as well as necessary submittals that project shall make in order to allow effective assessment of criterion by GSAS Trust. This section also provides the list of compliance levels of project and score associated with each level.

**MEASUREMENT** Describes the requirements the project must meet in order to demonstrate criterion compliance. Additionally, tools are provided to facilitate calculations for criteria that require computation.

**SUBMITTAL** Provides information on computation or documentation requirements that the project needs to submit in order to demonstrate compliance. These include plans, drawings, simulations, specifications, reports, and calculations.

**SCORE** Lists the range of possible compliance levels and the score associated with each level. In most criteria, the final score is computed based on the assessed construction practices, on-site measurements and calculations.
URBAN CONSIDERATIONS [UC]

The Urban Considerations category considers aspects related to traffic & transportation, reclamation & dredging and sewer & waterway contamination.

IMPACTS

Environmental impacts resulting from unsustainable urban practices include:

- Land Use & Contamination
- Water Pollution
- Air Pollution
- Human Health & Comfort.

MITIGATE IMPACT

Measures that could mitigate environmental impact include:

- Controlling the impacts of traffic/transportation on-site and neighboring sites
- Preventing any risks or pollution to sewer and waterways
- Encouraging best practices for reclamation and dredging

CATEGORY WEIGHT 7.00%

CRITERIA INCLUDED

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[UC.1] Traffic and Transportation Management

PURPOSE
To ensure that on-site and off-site construction traffic is managed effectively and to minimize disruption to local transportation infrastructure.

GUIDELINES
Traffic & Transportation Management Plan (T&TMPlan) for on-site traffic network takes into consideration the requirements of the relevant local and municipal authorities as well as meeting commuters’ needs & convenience.

a. A number of mitigation and management measures can be implemented to ensure appropriate on-site traffic and transportation management. These measures include:

- Minimize movement of plant, vehicles and the removal of materials & waste by road;
- Construct stabilized entrance/exits onto public paved surfaces (where required);
- Ensure that proper temporary and permanent road closures and diversions are made around the construction site;
- Provide appropriate interface with public / private roads or pedestrian walkway, if any;
- Provide adequate temporary traffic control measures and road signages;
- Provide adequate permanent and temporary accesses to the work site used by workers and visitors;
- Ensure provision of appropriate temporary road / haulage road layouts; and,
- Install speed control and monitoring;
b. A number of mitigation and management measures can be implemented to ensure appropriate off-site traffic and transportation management. These measures include:

- Avoid road closures, wherever possible. Where not possible, roads are re-instated or alternatives provided to restore traffic access. If any road closure is required, it is carefully planned to minimize impacts on traffic on the local road network associated with diversions and subsequent congestion.
- Minimize disruption of access for local residents and businesses and provide alternative access points, wherever possible.
- Ensure that adjacent residential areas are not disturbed by construction traffic routes as applicable.
- Scheduled, where possible, construction traffic in off-peak traffic times and on well-maintained routes.
- Provide appropriate traffic safety signage to warn the public of construction traffic where traffic merges with normal road traffic.
- Maintain adjacent roads and pavements in good condition, and major avoid damages due to heavy load transportation.
[II] ASSESSMENT

MEASUREMENT Projects shall develop and implement a Traffic & Transportation Management Plan (T&TMPlan), which will ensure that the on-site and off-site construction traffic is managed effectively.

SUBMITTAL Submit the Traffic & Transportation Management Report (T&TM Report) for on- and/or off-site traffic networks.

Supporting documents may include the following:
- Site map with clear directions indicating the alternative access points, road layouts, construction routes and parking;
- Adjacent roads’ map including any road closures and traffic diversions;
- Photographs and videos;
- Schedules of activities and audit reports;
- Local Authorities Permits for road closures and diversions; and,
- Any supporting documents and evidences that demonstrate the compliance.

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</table>

*Partial Compliance: Traffic & Transportation Management Report covers either on-site or off-site traffic management.
FURTHER RESOURCES

Websites:

1. Sustainable Construction Simple Ways to Make it Happen, BRE, https://www.bre.co.uk/


Publications:


6. Water Consumption in Construction Sites in the City of Recife/PE, Camilla Pires dos Santos, Simone Rosa da Silva, Cezar Augusto Cerqueira, Civil Engineering Postgraduate Program, University of Pernambuco, Recife, Brazil, 2015.


URBAN [UC.2] Sewer and Waterway Contamination CONSIDERATIONS

PURPOSE  To avoid contamination of waterways and reduce the burden on public treatment facilities.

[I] GUIDELINES  A) Stormwater & Waterway Contamination Control

Storm water resulting from a significant rainfall event during construction has the potential of being contaminated by toxic and hazardous materials on site. Consequently, such water may infiltrate and contaminate groundwater, or flow on to neighboring sites.

A number of mitigation and management measures can be instigated to control storm water and run-off. These control measures include:

a. Investigate the existing site hydrology, including the watercourses within the project site, to confirm the need and location for culverts and other drainage structures;

b. Ensure minimal impact by: (i) not scheduling construction activities when there is significant potential for heavy rainfall; (ii) undertaking backfilling activities in horizontal layers with dampened soil; and, (iii) undertaking in situ soil compaction immediately;

c. Implement the following for diversion of overland flow around work areas / construction sites:

   • For sites closer to water bodies maintain a ditch along the side of the water bodies as a minimum control measure to catch any runoff from reaching the water bodies;
   • Storm water collection drains are provided all along the stock piles and drained water are allowed to pass through a pit/sump to collect the silt prior for disposing the storm water into the water bodies and/or flooded areas; and,
   • Storm water run-off controls (bunds) are installed around soil stockpiles near the water bodies’ shoreline.
d. Implement the following to ensure effectiveness of storm water runoff:

- Sediment settling tanks or ponds for all storm water run-offs are provided within the project area.
- Any runoff with heavy sediments and particulate matter, due to a potential incident of heavy rainfall, are prevented from reaching the water bodies;

e. Implement the following measures to eliminate the waterway contamination:

- Ensuring that oil spillages are prevented on the site and that the contaminated site is immediately cleaned up;
- Ensuring that concrete washouts are designed to prevent waterway or underground contamination;
- Preventing wastewater discharged to the storm drains in all sites unless a proper wastewater treatment is done where applicable.

B) Sewer Contamination Control

A number of mitigation and management measures can be instigated to minimize or eliminate the sewer contamination. These control measures include:

a. Ensure that the extent of filtration, separation, or treatment that can occur before the connection of plumbing lines to off-site treatment facilities are determined to ensure compatibility with relevant regulations of local authority;
GUIDELINES & ASSESSMENT

[I] GUIDELINES  

b. Use individual or centralized pollution controls upstream of the stormwater discharge/collection points to capture gross pollutants and sediments picked up in stormwater runoff prior to discharge from the project site, comprising following controls:

- Gross Pollutant Traps (GPTs) that require adequate access points and regular cleaning to collect and suitably dispose-off the matter collected;
- An oil-bypass interceptor tanks to remove any suspended contaminants;

c. Provide moveable chemical toilets in different locations on the site if no connection to a sewer is available and no septic tanks are provided;

d. Provide appropriate training course(s) for all employees on determination, collection, storage, and safe disposal of liquid wastes.

C) Quality Control of Discharged Water

The quality of treated water at the discharge/collection points/networks (either sewer or storm water) shall adhere to local requirements and international standards. The minimum quality requirements for discharged waste water shall be ensured during construction process. The quality of treated waste water shall be checked for its adherence to standards by conducting regular physical and chemical testing on selected samples, collected from different discharge points on the construction site, at a qualified approved laboratory as follows.

a. A physical analysis of water samples to be conducted on-site to ensure the accuracy, as water samples obtained onsite exist in equilibrium with the surroundings.

b. A chemical analysis of water samples collected from the site to be conducted in a qualified laboratory to ensure no toxic substances are present.
[II] ASSESSMENT

MEASUREMENT
Projects shall develop and implement a Sewer & Waterway Contamination Control Plan to manage storm water, control sewer & waterway contamination and remove all toxic and hazardous liquid wastes during construction works.

SUBMITTAL
Submit the Sewer and Waterway Contamination Control Report demonstrating how Sewer & Waterway Contamination Control Plan is implemented.

Supporting documents may include the following:
- Drawings for storm water and sanitary drainage systems;
- Drawings for storm water and sanitary tank filtration systems;
- Specifications and results of the physical and chemical tests conducted on the waste water, discharged into the public networks.

SCORE

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* Partial Compliance: Sewer & Waterway Contamination Control Report covers control of A) Stromwater & Waterway Contamination or B) Sewer Contamination.
FURTHER RESOURCES

Websites:


Publications:


11. United States. Environmental Protection Agency. Managing Your Environmental Responsibilities:

URBAN [UC.3] Reclamation and Dredging CONSIDERATIONS

PURPOSE To minimize disturbance to land and water quality and adverse impact on marine environment.

[I] GUIDELINES A) General Controls

Reclamation and dredging methods adopted and equipment used have direct impact on water quality and marine environment of the surrounding sites.

A number of mitigation and management measures can be instigated to minimize any potential adverse impacts of reclamation and dredging. These control measures include the following.

a. Schedule dredging or reclamation works to:

- Avoid seasonal weather impacts and plume migration near sensitive areas;
- Avoid disruption of major, public, maritime activities, for example - sailing regattas, speed boat races and ferry operations;
- Avoid work during turtle hatching period, coral spawning period, or migratory bird roosting grounds at relevant times; and,
- Maximize opportunities for plume containment with respect to breakwater construction.

b. Use sediment loss prevention/minimization measures when working near environmentally sensitive areas.

c. Test transport equipment for leaks and breaks prior to material transportation and frequently monitor for leaks and blockages during operation.

d. Ensure that pipeline sections are quick and easy to assemble, maintain and dismantle, because it may be periodically necessary to halt dredging operations to add or remove sections of the pipeline to repair leaks or reroute the line.
[I] GUIDELINES  

e. Inspect barge hulls regularly to ensure that they are completely sealed.

f. Prevent spillage while in tow by placing removable covers over the barge coaming.

B) Silt Curtains

Silt curtains are a type of containment barrier used to control suspended sediments in the water column that may be generated by dredging and reclamation. Silt curtains reduce water movement in the area contained by the curtain, which then allows suspended sediment within the contained area to settle out of suspension, before the water disperses more broadly.

A number of mitigation and management measures can be instigated to ensure silt curtains effectiveness. These control measures include the following.

a. Ensure that silt curtain is approved by local authorities’ representative as installed correctly prior to works starting adjacent to or within the water.

b. Ensure that silt screen is complete with a scum boom as well. The size and gauge of the silt curtain is appropriate. It is not acceptable to have the floating solid silt screen with a screen that does not reach the sea floor at all times, as the sediment-laden water can pass beneath it, thus negating the purpose of a silt curtain.

c. Add adequate weights to the bottom of the silt screen from the outset, as this will prevent the screen from floating.

d. Remove any scum, that develops within the fenced off area, with a net or similar and stored on land within containment to dry out prior to disposal.
[II] ASSESSMENT

MEASUREMENT  Projects shall develop plan for reclamation and dredging activities.

SUBMITTAL  Submit a Reclamation and Dredging Report demonstrating how Reclamation and Dredging activities are implemented.

Supporting documents may include the following:
- Documents outlining activities and schedules;
- Photographs and videos as appropriate;
- Monitoring protocols and audit reports; and,
- Any other supporting documents or evidences that demonstrate the compliance.

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*Partial Compliance: Reclamation and Dredging Report covers provisions for A) General Controls only.
FURTHER RESOURCES

Websites:

1. Sustainable Construction Simple Ways to Make it Happen, BRE, https://www.bre.co.uk/

Publications:

6. Water Consumption in Construction Sites in the City of Recife/PE, Camilla Pires dos Santos, Simone Rosa da Silva, Cezar Augusto Cerqueira, Civil Engineering Postgraduate Program, University of Pernambuco, Recife, Brazil, 2015.
**SITE [S]** The Site category considers aspects related to land preservation, habitat preservation, erosion & sediment control, soil & earthworks control and groundwater & dewatering control.

**IMPACTS** Environmental impacts resulting from unsustainable urban practices include:

- Land Use & Contamination;
- Water Pollution;
- Air Pollution;
- Human Comfort & Health.

**MITIGATE IMPACT** Factors that could mitigate environmental impact include:

- Preserving or enhancing land quality;
- Preserving habitats that exist on the site;
- Controlling erosion and prevent off-site sedimentation;
- Controlling impacts to soil and groundwater during construction works;
- Controlling impacts of dewatering and discharge activities.

**CATEGORY WEIGHT** 15.00%

**CRITERIA INCLUDED**

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SITE [S.1] Land Preservation

PURPOSE To preserve or enhance the land through remediation, conservation, and/or restoration and to discourage development on ecologically valuable sites.

[I] GUIDELINES The conservation of the natural state of the site takes into consideration the existing topography, soil, trees, plants, groundcover, water features, and wildlife habitats. The ecological value of the land from the time it was acquired up to the construction stage shall be improved and maintained. Adequate protection measures during construction works especially for highly valued ecological site shall be observed. Where any land of ecological value was present outside the construction zone but within the development site, the contractor shall ensure that it is preserved and kept undisturbed by the construction works.

A) Preservation of soil condition

Reducing unnecessary disturbance of soil is important for conserving the natural resources of the site. Healthy soils can effectively cycle nutrients, store carbon as organic matter, maximize water holding capacity, and provide a healthy rooting environment and habitat to a wide range of organisms.

Excessive soil disturbance can take place due to excavation for the construction of buildings, landscaping, development of infrastructure, man-made water bodies, dredging for new coastline, or infilling for man-made islands.

Excavation or fill required on-site will not only decrease the ecological value of the site, but also increase the need for transport and contribute to the depletion of fossil fuels. Soil disturbance may also release natural Volatile Organic Compounds (VOCs), which leads to air pollution. Additionally, the excavation of soil to create man-made water bodies requires a significant amount of water and therefore increases the demand for sea water desalination.
A number of mitigation and management measures shall be implemented to ensure land preservation. These control measures include the following.

a. Import, when necessary, higher quality topsoil to mix with existing soil or to replace soil of lower quality. Amending the soil with organic material improves water holding capacity.

b. Minimize soil compaction by identifying pathways and areas during construction for heavier equipment, in order to localize affected areas.

c. Minimize the length of time soil remains barren or uncovered to avoid erosion due to wind. Use groundcover in landscaped areas to prevent soil movement.

d. Leave existing trees, vegetation and soil undisturbed to the greatest extent possible.

B) Use of Contaminated Land

a. Conduct an investigation to test for hazardous levels of pollution on the site of contaminated land, during construction phase.

b. Determine, if required, strategies to remediate contaminated areas in order to further prevent risks to the environment and human health.

c. Determine, if required, strategies for remediation by the type and degree of contamination, natural site features, level of short and long term effectiveness, and available funds and time frame for completion.

d. Ensure that all remediation strategies should have minimal disruption to the site, including underground features. Continue the monitoring of land after remediation takes place to ensure that all hazardous substances have been completely cleared from the site.

e. Remediate contaminated groundwater using pump-and-treat technologies, where the water is pumped to the surface and treated using physical or chemical processes.

f. Remediate the contaminated soils through several methods including, in-situ applications, off-site disposal, the use of bioreactors and solar detoxification technologies.

g. Consider mainly to minimize negative environmental impacts while selecting and implementing remediation strategies/methods.
[II] ASSESSMENT

MEASUREMENT

(I) Projects shall develop a Land Preservation Plan demonstrating how land preservation is implemented.

(II) Projects shall complete the Land Preservation Calculator to determine the area restored or enhanced.

SUBMITTALS

(I) Submit the Land Preservation Report demonstrating site assessment and strategies to conserve, restore, or enhance the site.

Supporting documents may include the following:
- Site Assessment Report;
- Soil Erosion Plan (if applicable);
- Site plan identifying areas of varying degrees of soil quality, soil disturbance, and contaminated land for pre- and post- development;
- Site plan identifying areas to be conserved, restored, or enhanced;
- Specifications that illustrate how site remediation, conservation, and restoration outlined in the Site Assessment Report will be implemented; and,
- Any other drawings that meet the specific requirements of the Site Assessment Report.

(II) Submit the Land Preservation Calculator indicating all relevant data.

Supporting documents may include as stated above.
SCORE  (CASE A - INHERITANCE OF SCORE)

For a project pursuing this criterion under GSAS Design & Build certification, the score will be inherited according to the awarded Provisional Certificate (Letter of Conformance – LOC).

(CASE B - NO INHERITANCE OF SCORE)

For a project pursuing this criterion under GSAS-CM only.

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</table>
FURTHER RESOURCES

Websites:


Publications:


SITE  [S.2] Habitat Preservation

PURPOSE  To encourage construction processes and practices those preserve the biodiversity of the site in order to protect the natural ecosystems.

[I] GUIDELINES  The increasing rate of development is placing a significant stress on the richness of our biodiversity. Lands of habitat for wildlife species are converted into residential, commercial developments, infrastructure and other uses. The fast-paced development of land destructs and fragments the habitat at site, impacting its quantity and quality. Development eliminates and significantly changes many important habitat features, thereby altering the habitat value of the site. Furthermore, linear developments are generally responsible for fragmentation of habitats. When habitat of ecologically sensitive species is separated by distances, it makes their movement from one area to another impossible; which affects their health and the ability to reproduce that results in fewer species. Examples of sites with high ecological value are: areas containing rare and endangered wildlife species; sites with a high representation of indigenous biodiversity; key biological sites such as wetlands, seagrass beds, and mangroves; and areas that could be easily rehabilitated to provide a suitable habitat for wildlife.

Ecologically sensitive habitats are not limited to the project site and usually extend into adjacent areas and beyond. The impact of development extends beyond the actual area of development. The encroachment of development into a natural area creates changes in environmental conditions as well as in animal behavior and well-being. It reduces the amount of interior habitat area adjacent to border, which affects its ability to support species requiring isolated interior.
Furthermore, landscape disturbance caused by development can also serve to introduce invasive species into natural habitats, further degrading the quality of the remaining habitat areas. Despite the fact that construction can have many adverse impacts on biodiversity, development is still essential for the improvement of social and economic well-being. Therefore proper implementation of the Habitat Preservation plan during the construction stage shall be imposed in order to protect and preserve the habitat without compromising the quality of development.

A number of mitigation and management measures shall be implemented to ensure habitat preservation. These control measures include the following.

a. Conduct site assessment and employ construction processes and practices that protect all habitats, natural vegetation, and wildlife on the site to prevent degradation of biodiversity.

b. Protect adequately all the existing features of ecological value, as identified in the Site Assessment Report, surrounding the construction zone and site boundary area from damage during clearance, site preparation and construction activities.

c. Designate an ecological zone to protect habitats from the impact of the processes. In cases where habitats and vegetation are to be disturbed during construction, develop a plan to restore the native ecology by replanting the disturbed vegetation and reintroducing the same construction species and habitats after construction is complete.

d. Consult with an ecologist to create a Habitat Preservation Plan that maintains and enhances habitats and ecosystems on the site. The plan catalogs all species on-site before and after construction in order to preserve the biodiversity and encourage the use of native plants.
e. Where it is not possible to implement ecological enhancements within the construction zone due to overriding security issues, or where space for ecological enhancements within the zone is severely limited, taken into account the ecological enhancements made to other areas of the site.

f. Train the site workforce on the protection of the site’s ecology during the project. Organize specific training for the entire site workforce to ensure they are aware of how to avoid damaging site ecology.

g. Encourage provision and implementation of effective tree preservation and protection measures. Retain, preserve, and protect all the identified and designated healthy trees within the site shall be within the site or transfer them to other site for their reuse. Impose the implementation and monitoring of the tree protection measures on site to minimize adverse impact to the preserved trees due to construction activities. Formulate specific tree preservation of transplantation measures for larger trees with high amenity value. Further, ensure that on-site trees and undergrowth integrated into the landscape plan are adaptive or native to the ecosystem.
[II] ASSESSMENT

MEASUREMENT Projects shall develop Habitat Preservation Plan outlining the strategies to conserve, restore, or enhance habitats and the biodiversity of the site during construction phase.

SUBMITTALS Submit the Habitat Preservation Report.

Supporting documents may include the following:

- Diagrams or drawings that identify all habitats in the construction site;
- List of plant and animal species;
- Site ecological value protection strategy report which contains plans, diagrams or drawings that illustrate strategies for preserving ecosystem interaction within the site and adjacent areas;
- Photographic evidences confirming planting in accordance with the design stage plan;
- Tree Relocation/Cutting Permit, if applicable;
- Tree Protection Plan including replanting strategies and specific method statement for tree preservation and transplantation;
- Drawings showing the existing and new tree locations and numbers;

OR

- Evidences demonstrating unavailability of vegetation or endangered habitat.
SCORE (CASE A - INHERITANCE OF SCORE)

For a project pursuing this criterion under GSAS Design & Build certification, the score will be inherited according to the awarded Provisional Certificate (Letter of Conformance – LOC).

(CASE B - NO INHERITANCE OF SCORE)

For a project pursuing this criterion under GSAS-CM only.

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</tr>
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<td>3</td>
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</tr>
</tbody>
</table>

*Partial Compliance: Habitat Preservation Report refers to preservation of either flora or fauna which one is of higher preservation priority to the region based on advisory from the regulatory authority.
FURTHER RESOURCES

Websites:


Publications:

SITE  [S.3] Erosion and Sediment Control

PURPOSE  To minimize soil erosion and prevent off-site sedimentation due to the activities associated with the project construction works.

[I] GUIDELINES  A) Erosion Control

Sustainable construction minimizes soil loss associated with erosion and sedimentation on the project site.

The most environmentally dangerous period of development with respect to soil erosion and off-site sedimentation is the initial construction phase when land is cleared of vegetation and the topography is graded to create a proper surface for construction. The removal of natural vegetation and topsoil makes the exposed area particularly susceptible to erosion, leading to the degradation of soil quality, structure and texture of the soil. It can cause instability of both above and below grade structural features, including earthen embankments, built structures, and roadways and even change the texture due to breakdown of aggregates and the removal of smaller particles or entire layer of soil or organic matter. Further, these textural changes can alter the water holding capacity of the soil, enhancing susceptibility of the site to extreme conditions such as drought. Moreover, offsite sedimentation can cause degradation of downstream water quality and damage marine habitat. Sediment that reaches streams or watercourses can accelerate bank erosion, obstruct stream and drainage channels.
[I] GUIDELINES

A number of mitigation and management measures shall be implemented to ensure erosion control effectiveness. These control measures include the following:

a. Develop a Soil Erosion Control Plan to employ erosion control practices, such as preserving natural vegetation where possible, directing the runoff away from exposed soils, planting temporary groundcover, and permanent revegetation of areas at risk for erosion damage. The plan shall include information on the soils present on the site and area of disturbance and summarizes design requirements that include amount, frequency, intensity, and duration of precipitation. It shall identify the stormwater runoff and run-on at the site, including expected flow and any controls to minimize peak and total stormwater volume. It shall also describe the stormwater discharge areas to maximize infiltration and increase sediment removal.

b. Avoid soil disturbance as far as possible to minimize soil erosion. Erosion rates are directly proportional to the type and density of groundcover on the site.

c. Provide additional means of erosion prevention and sediment control to the areas where soil is disturbed, because these areas are more prone to erosion and invasive weed species.

d. Preserve natural vegetation as it is the most efficient and inexpensive form of erosion control, greatly reducing the need for revegetation.

e. Create buffer zones and setbacks to reduce the amount of erosion and runoff from the site. Restrict activities in areas with erosive potential by creating undisturbed areas with natural vegetation or areas that are suitable for revegetation with native plant species. Consider use of buffer zones and setbacks to protect streams and waterways, environmentally sensitive habitats, neighboring properties, structures, roadways, and pathways.
f. Plant/replant non-vegetated areas prone to erosion with native species to prevent further damage. Vegetation/revegetation helps to prevent erosion by slowing down runoff drainage on hillsides and protecting soil from wind erosion. The roots of plants serve to stabilize soils, and revegetation enhances water infiltration in the soil, reduces runoff, and traps sediment.

g. Develop a plan for erosion maintenance during construction including inspection and repair schedules.

B) Sediment Control

Sediment control is a practice to keep eroded soil on the construction site. It is the second line of defense in case the erosion control measures are not fully functioning. Sediment control prevents the soil from washing off and causing water pollution to a nearby stream, or sea. Often these practices intercept and slow or detain the flow of stormwater to allow sediment to settle and be trapped.

A number of mitigation and management measures shall be implemented to ensure sediment control effectiveness. These control measures include the following:

a. Install linear sediment barriers (such as silt fence, sandbag barrier, and straw bale barrier), which are typically placed below the toe of exposed and erodible slopes, down-slope of exposed soil areas, around soil stockpiles, and at other appropriate locations along the site perimeter;

b. Install buffer zone or vegetated filter strip to catch sediment and decrease velocity of runoff;

c. Install earth dykes to contain sediment;
d. Make diversion ditches to keep up-slope runoff from crossing areas of high erosion risk and direct runoff to temporary sediment trapping basins;

e. Ensure that drain surface of drainage lines are rock-lined to minimize erosion;

f. Install a sediment basin (temporary pond) to capture eroded or disturbed soil that is washed off during rain storms, and protect the water quality of a nearby river, sea or lake;

g. Install silt fence, which is a temporary sediment control device used on construction sites to protect water quality in nearby streams, rivers, lakes and seas from sediment (loose soil) in stormwater runoff. Silt fences are perimeter controls, typically used in combination with sediment basins and sediment traps, as well as erosion controls, which are designed to retain sediment in place where soil is being disturbed by construction processes (i.e., land grading, reclamation and other earthworks). Consider the following in silt fence installation;

• Silt fence is to be installed along the perimeter of the area to be cleared and graded before any grading that takes place and placed around all soil and erodible materials stockpiles;

• Silt fence is to be properly installed by being trenched and buried into the soil to stop the fence floating free when a strong current of flow strikes it;

• Sediment is captured by silt fences primarily through ponding of water and settling, rather than filtration by the fabric. Sand and silt tends to clog the fabric, and then the sediments settle in the temporary pond.

h. Develop a plan for sediment control maintenance during construction including inspection and repair schedules.
[II] ASSESSMENT

MEASUREMENT

Projects shall develop Erosion & Sediment Control Plan indicating the strategies to minimize soil erosion and prevent off-site sedimentation, and will implement mitigation and management measures to reduce soil erosion impacts that destabilize the ground and generate dust.

SUBMITTALS

Submit the Erosion & Sediment Control Report.

Supporting documents may include the following:

- Site topographic map including soil survey information;
- Site development plan and project/construction schedule;
- Maintenance/monitoring plan of soil erosion & sediment control measures; and,
- Any other document deemed necessary for the support of effective control plan.

SCORE

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</tr>
<tr>
<td>3</td>
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</tr>
</tbody>
</table>

FURTHER RESOURCES

Websites:


Publications:


SITE  [S.4] Soil & Earthworks Control

PURPOSE  To minimize impacts on or pollution of soil and groundwater during the construction works.

[I] GUIDELINES  A) Earthworks Control

Earthworks are engineering works created through the moving or processing of quantities of soil or unformed rock. Typical earthworks include constructing roads, railway beds, causeways, dams, levees, canals, and berms, as well as land grading to reconfigure the topography of a site, or to stabilize slopes.

a. Undertake following general earthworks control measures in order to minimize/mitigate potential soil and water contamination during earthwork activities:

• Stockpile the excavated materials for as short time as possible;
• Minimize handling of excavated materials and the distances from the excavation site to the fill site;
• Do not schedule, wherever possible, earthwork activities when there is significant potential for heavy rainfall, and stop the work upon the occurrence of a storm event;
• Undertake backfilling activities in horizontal layers with soil having previously been dampened. Compact soils immediately in situ to minimize erosion.

b. Undertake the following in re-profiling (cut and fill), which is the process of constructing a railway, road or canal whereby the amount of material from cuts roughly matches the amount of fill needed to make nearby embankments.

• Design the cut and fill requirements for the project in a way that limits earthworks.
• Minimize cutting by locating the route in close proximity to existing developed areas and infrastructure, where feasible, and along valley floors in the large dune areas.
[I] GUIDELINES

- Dispose excess dune sand material to avoid damaging sensitive environments such as sections of Sabkha containing sand roses.
- Ensure that material used to backfill excavations are suitable for the intended purpose and should show no visual or olfactory evidence of contamination.
- Test the material obtained for earthworks from off-site sources, prior to placement to ensure compliance and suitability.

c. Horizontal Directional Drilling and Piling (HDD) is a steerable trenchless method of installing underground infrastructure such as telecommunications and power cable conduits, water lines, sewer lines, gas lines, oil lines and product pipelines, when trenching or excavating is not practical, especially in urban areas for developing subsurface utilities. Ensure the following practices while carrying out HDD:

- Ensure that adequate sized earth berms are installed around the giving and receiving pits for the boring/piling works in order to contain the drilling fluid slurry when it exits, especially in the case of a 'blow out';
- Install a secondary earth berm around the boring/piling works if required;
- Monitor works to ensure no spillage of slurry into water, mangroves or land; and,
- Monitor disposal of slurry material to ensure that it is removed in compliance with regulatory authority standards.
[I] GUIDELINES  B) Stockpile Management

Stockpiled soil and other earthworks materials are common on construction sites and are a potential source of dust and sediment run-off. Soil stockpiles, like disturbed soil areas, are susceptible to erosion.

The requirements for effective stockpile management vary by type (material in stockpile), status (active or non-active) and season (rainy or non-rainy).

A number of mitigation and management measures shall be implemented to ensure effectiveness of stockpile management. These control measures include the following:

- Where access to stockpiles is not required for a long period, cover the stockpile with netting or similar material to minimize wind erosion and storm water ingress into material;
- Water down (either by hand or temporary sprinklers) unstabilized stockpiles (and those being regularly worked) to suppress dust;
- Place stockpiles in sheltered or covered areas, with temporary wind screens erected around stockpiles exposed to wind effects where necessary;
- Locate stockpiles on flat areas, away from stormwater or dewatering drainage flow paths, with diversion of all up-gradient flows around stockpiled material;
- Install a berm around the long-term stockpile to prevent runoff and entry of potential stormwater from other areas;
- Take stabilization measures to protect the stockpile from rain and wind erosion that include hydro-seeding, mulching, plastic sheeting, or similar measures.
[II] ASSESSMENT

MEASUREMENT
Projects shall develop Soil and Earthworks Control Plan outlining the strategies to eliminate or minimize pollution to soil and control earthworks impacts.

SUBMITTALS
Submit a Soil and Earthworks Control Report.
Supporting documents may include the following:
- Environmental Impacts Assessment (EIA) Report;
- Geotechnical investigation report;
- Contaminated site assessment report; and,
- Any other document deemed necessary for the support of effective control Report.

SCORE

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</table>

*Partial Compliance: Soil and Earthworks Control Report adequately covers the provisions for A) Earthworks Control or B) Stockpile Management.
FURTHER RESOURCES

Websites:

1. Sustainable Construction Simple Ways to Make it Happen, BRE, https://www.bre.co.uk/


Publications:


6. Water Consumption in Construction Sites in the City of Recife/PE, Camilla Pires dos Santos, Simone Rosa da Silva, Cezar Augusto Cerqueira, Civil Engineering Postgraduate Program, University of Pernambuco, Recife, Brazil, 2015.


SITE [S.5] Groundwater and Dewatering Control

PURPOSE To minimize pollution to groundwater during construction works and control impacts of dewatering and discharge activities.

[I] GUIDELINES A) General Dewatering Requirements

A number of mitigation and management measures shall be implemented to avoid any adverse consequences as a result of dewatering and discharge activities. These control measures include the following.

- Limit the excavation below the groundwater table as far as it is possible.
- Undertake dewatering during the construction of structures, and apply it at the foundation locations only. Bore a ring of point wells around each site and then install a dewatering system to draw down water around the foundation excavation site only.
- Dewatering is required for pile head construction for foundations at the sites of major structures and is kept to a minimum. Limit, as much as possible, the duration of dewatering.
- The preferred receiving medium for discharge of non-contaminated groundwater is land (in a constructed lagoon/basin or large tank), followed by stormwater network and a waterbody (such as the sea), subject to local authority approval and water quality test results.
[I] GUIDELINES   B) Discharge of Groundwater

A permit from Regulatory Authority is required for all discharges of groundwater and other water from construction activities. This is regardless of their receiving medium, whether land, sea or other water bodies.

a. Discharge of Groundwater to Land or Enclosed Lagoon

- Develop a plan identifying the area intended to receive the discharge waters. Clearly mark the land use of this area and surrounding areas, noting any environmentally sensitive areas such as wetlands, lakes, schools or residences.
- Implement drainage control measures to prevent dewatering material from entering low lying areas, which may cause flooding of adjoining land and vegetation.
- Ensure that dewatering discharge does not cause soil erosion or sediment accumulation problems. The contractor is responsible for putting in place control measures, including detention basins/tanks.
- People and native animals can drown in temporary lakes, particularly with steep sides. Provide a chain-mesh fence to all dewatering ponds and lakes which is at least 1.6 metres high and, adequate signage providing warning of maximum water depth and that the water is not suitable for human consumption.
- Provide a stepped or terraced slope up to the water surface, to temporary lakes, to allow people or animals to easily climb out if they fall in.
- Standing water (e.g. lakes, ponds) has potential to breed mosquitoes and other insect pests. Take measures to prevent this from occurring.
b. Discharge of groundwater to storm water network

- The requirements for effective stockpile management vary by type (material in stockpile), status (active or non-active) and season (rainy or non-rainy).
- Do not discharge to storm water network in a way that compromises the effectiveness of the existing stormwater system;
- Ensure that hoses typically discharge through manholes into the stormwater system; and,
- Ensure that alternative sources of discharge location are available during heavy rain events which may overwhelm the stormwater system.

c. Discharge of groundwater to marine or other water body

- Ensure that groundwater is discharged more than 50 metres from the shoreline, into the deepest part of the channel/ water body (usually the center);
- If discharged to the marine environment, keep discharge location of groundwater at least 1 meter below the lowest low tide level to allow adequate mixing of the discharged water with the seawater;
- Reduce the discharge flows to prevent scour and, where necessary, employ edge protection measures;
- Indicate the location of the discharge pipe outlet using a marker buoy.
C) Formation of Evaporation Lakes

Onsite evaporation lakes – Use temporary lakes to store water, to allow evaporation. Comply with the following requirements:

- Carry out a water balance to determine discharge inflow plus other potential inflows (rainfall, stormwater) against outflows (evaporation and infiltration) and storage volume; Enclose lakes fully by a chain-mesh fence at least 1.6 meters high, and provide signage with a warning mentioning the maximum water depth, and that the water is not suitable for human consumption;
- Provide a stepped or terraced slope to temporary lakes up to the water surface, to allow people or animals to easily climb out if they fall in; and,
- Since standing water (lakes, ponds) has potential to breed mosquitoes and other insect pests, take measures to prevent this from occurring.

D) Monitoring Requirements

Visually monitor on a regular basis, the dewatering of groundwater. This may form part of the weekly inspection checklists.

- On a regular basis test the water, following national / international standards, for all required parameters and to minimum detection limits to allow adherence to the regulatory authority limits.
- Contractor to provide local and government authorities with the details of the treatment before discharging.
- Provide reports on the amount of discharged water to the water body as well as monitoring of water quality of the discharged water at the discharge point at least to meet the local regulatory requirements. The water quality analysis report shall contain the necessary information on the water to be tested, sampling collection, sampling & delivery dates, intended laboratory and QA/QC testing procedures. The report may contain information on the amount of discharged water.
[II] ASSESSMENT

MEASUREMENT  Projects shall develop Groundwater and Dewatering Control Plan outlining measures to minimize the pollution of groundwater and minimize the impacts of dewatering and discharge activities during construction works.

SUBMITTALS  Submit a Groundwater and Dewatering Control Report.

Supporting documents may include the following:

- Evidences for the compliance of the provisions of the discharge permit;
- Site map demonstrating location of discharge facility and area intended to receive the discharged water with route clearly marked and identified;
- Site plan indicating dewatering network set-up;
- Site plan identifying the area intended to receive the discharge waters;
- Alternative options or locations for discharge, if applicable;
- Groundwater investigation report which quantifies the amount of water expected to be encountered during excavation and construction processes;
- Monitoring plan which includes reported dewatering problems and accidents;
- Laboratory analysis report for the quality of discharged waste water.
SCORE

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*Partial Compliance: Groundwater and Dewatering Control Report demonstrates that dewatering is not required on the project site.
FURTHER RESOURCES

Websites:

1. Sustainable Construction Simple Ways to Make it Happen, BRE, https://www.bre.co.uk/


Publications:


6. Water Consumption in Construction Sites in the City of Recife/PE, Camilla Pires dos Santos, Simone Rosa da Silva, Cezar Augusto Cerqueira, Civil Engineering Postgraduate Program, University of Pernambuco, Recife, Brazil, 2015.


ENERGY [E] The Energy category considers the aspects related to energy management and overall CO₂ emissions reduction in contractor’s use of energy during construction.

IMPACTS Negative impacts resulting from unsustainable energy use include:

- Climate Change;
- Fossil Fuel Depletion;
- Threat to energy security;
- Air Pollution;
- Human Comfort & Health.

MITIGATE IMPACT Measures that could mitigate environmental impacts due to unsustainable energy use include:

- Selecting efficient building systems;
- Selecting energy efficient construction equipment and machineries;
- Improving energy delivery systems and the energy supply network by use of renewable and/or low-carbon energy sources, and reducing distribution losses.

CATEGORY WEIGHT 16.00%

CATEGORY INCENTIVE WEIGHT 3.00%

CRITERIA INCLUDED

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ENERGY [E.1] Energy Management

PURPOSE To minimize energy consumption in buildings on construction site in order to reduce impacts associated with energy use.

[I] GUIDELINES This criterion is dedicated to energy consumption and its management for applications in buildings only. This includes energy use at site offices, canteens, workers’ accommodation (if attached to construction site) and any temporary office/accommodation facility at construction site.

The contractor is encouraged to reduce building energy consumption under this criterion to achieve higher score. This is based on comparison of building energy consumption with the reference value.

Contractors shall strive to achieve better energy ratings in the GSAS building energy assessment. The provision of buildings with higher GSAS energy ratings during the construction process is the most effective way to reduce energy consumption. One way to achieve this is by targeting higher energy performance scores (lower values of Energy Performance Coefficient, EPC).

All EPC values are based on normative, standardized calculations or measurement of outcomes (energy use as built either calculated or measured), and divided by a reference value for a given building type. Analogously, in the GSAS scoring method, lower the energy consumption (or lower EPC value); higher the resulting GSAS score (0, 1, 2 & 3). Building energy demand on subsystems, such as HVAC, lighting, and power, can be reduced by making good selections in building system types and their sizing. These guidelines provide recommendations for the contractor to meet the imposed limits on energy use with pointers on the standard calculations that have to be conducted to demonstrate compliance with the requirements. The most important design parameters of buildings that should be addressed are building envelope, building internal loads (lighting and equipment), HVAC systems, Domestic Hot Water (DHW), pumps and controls.

Making the right decisions about the above elements will result in a facility that consumes less energy.
[I] GUIDELINES  A) Building Envelope

- Select envelope elements with low Overall Heat Transfer Coefficient or U-Values (high R-Values) to reduce both solar and conductive heat gains and losses.
- Specify all windows and skylights with low Solar Transmittance to control solar gain and reduce cooling load.
- Increase roof surface reflectance through the use of reflective paints, materials or coatings.
- Minimize air leakages occurring between the pipe/duct exterior and the penetration opening.
- Use hybrid ventilation strategies, such as providing operable windows, where possible.
- External shading devices protect the building against excessive solar gains during the summer.

The recommended values for building envelope are shown in the table below. However, these values should be used as guideline only and not as prerequisites. The building performance could be optimized by using the energy calculator and choose proper tradeoffs between envelope, and other parameters.

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B) Building Internal Loads

- Select more efficient interior lighting. The widespread availability of compact fluorescent lamps, and LED (light-emitting-diode) lighting options should reduce lighting electricity consumption as well as heat gains in air conditioned area reducing the energy consumption for air conditioning.

- When applicable, try to apply methods of total light management, where external solar shading, internal shading, and electric lighting are controlled in a holistic manner.

- Select more energy efficient electrical appliances (e.g. washing machines, refrigerator) to reduce the electricity requirements of plug loads and reduce heat gains in air conditioned areas from the usage of appliances, office equipment, and other devices plugged into electrical outlets.

The recommended values for lighting and equipment energy consumption intensity for building are shown in the table below. However, these values should be used as guideline only and not as requisites. The building performance can be optimized by using the Energy Calculator which facilitates the selection of building materials, equipment and systems to appropriate trade-offs between envelope, building materials, lighting and equipment.

<table>
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<td>&lt;6 W/m²</td>
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<tr>
<td>Offices</td>
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<tr>
<td>&lt;5 W/m²</td>
<td>&lt;2.5 W/m²</td>
</tr>
</tbody>
</table>
[I] GUIDELINES  

C) HVAC Systems

- Select equipment to suit design that helps to bring the operational performance close to their maximum efficiency performance levels based on manufacturer data.
- Use direct digital control systems to optimize start-up or shut-down of the HVAC systems.
- Avoid using temperature sensors that can be adjusted and tempered locally.
- Provide provisions for recovery of waste heat for pre-heating the water.
- The recommended value for the HVAC system Energy Efficiency Ratio is more than 1.8 kWth/kWe.

D) Metering

- Install appropriate metering equipment for measurement of energy performance of building/s.
- Provide sufficient representation for the hours or metering and ensure adequate intervals of recording.

[II] ASSESSMENT

MEASUREMENT

Project shall develop and implement Energy Management Plan describing measures for energy saving in buildings and associated responsibilities.

Projects shall complete the Energy Calculator to determine the calculated Energy Performance Coefficient (EPCc) value and the measured Energy Performance Coefficient (EPCm) value.

The calculated value of EPC (EPCc) in following equation is based on building data, HVAC, lighting, DHW, and equipment specifications.

\[
EPC_c = \frac{E_c}{E_{ref}}
\]

In this equation \( E_c \) represents calculated energy consumption of building based on installed capacity, and \( E_{ref} \) represents the reference energy value of GSAS-CM for the applicable building type.
MEASUREMENT

The measured EPC\textsubscript{m} value calculated in following equation is based on energy measurements. It deals with controlling energy supply components to assist energy management within the buildings. The measured value includes those from HVAC systems, lighting systems, DHW and equipment.

\[
EPC_{m} = \frac{E_{m}}{E_{ref}}
\]

In this equation:

- \(E_{m}\) represents measured energy consumption of building,
- \(E_{ref}\) represents the reference energy value of GSAS-CM for the building type.

The EPC rates the construction site buildings' performance in terms of energy use, by using scoring and bands from 0 to 3 and A+ to D based on their EPC value which is an indicator of how efficiently building uses energy as compared to reference energy consumption.
SUBMITTAL

(I) Submit the Energy Management Report highlighting energy saving measures implemented and responsibilities for each of them.

Following supporting documents may be submitted:

- As-built drawings for all offices, accommodations, canteen building as well as temporary office/ accommodation structures attached to site;
- Relevant mechanical, electrical, and plumbing (MEP); drawings and equipment specifications or data sheets;
- Energy monitoring data;
- Supporting documents for installed building materials and systems.

(II) Submit the Energy Performance Calculator indicating all the relevant calculated and measured data.

Supporting documents as indicated above may be submitted.

(III) Submit relevant records for training and awareness generation as planned under GSAS-CMP.
The criterion is assessed using following two different scoring: energy consumption calculation; and, energy consumption measurement. The final score for this criterion will be used based upon the pre-decided weights for each scoring.

1. Calculated Energy Consumption

<table>
<thead>
<tr>
<th>Score</th>
<th>Requirements ((\text{EPC}_c \text{ Value}))</th>
<th>EPC Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(\text{EPC}_c &gt; 1.0)</td>
<td>D</td>
</tr>
<tr>
<td>1</td>
<td>(0.90 &lt; \text{EPC}_c \leq 1.0)</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>(0.85 &lt; \text{EPC}_c \leq 0.90)</td>
<td>C+</td>
</tr>
<tr>
<td>2</td>
<td>(0.75 &lt; \text{EPC}_c \leq 0.85)</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>(0.70 &lt; \text{EPC}_c \leq 0.75)</td>
<td>B+</td>
</tr>
<tr>
<td>3</td>
<td>(0.60 &lt; \text{EPC}_c \leq 0.70)</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>(\text{EPC}_c \leq 0.60)</td>
<td>A+</td>
</tr>
</tbody>
</table>

2. Measured Energy Consumption

<table>
<thead>
<tr>
<th>Score</th>
<th>Requirements ((\text{EPC}_m \text{ Value}))</th>
<th>EPC Band</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy Management Report demonstrates compliance</td>
<td>Pre-requisite met</td>
</tr>
<tr>
<td>0</td>
<td>(\text{EPC}_m &gt; 1.0)</td>
<td>D</td>
</tr>
<tr>
<td>1</td>
<td>(0.90 &lt; \text{EPC}_m \leq 1.0)</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>(0.85 &lt; \text{EPC}_m \leq 0.90)</td>
<td>C+</td>
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<td>(0.75 &lt; \text{EPC}_m \leq 0.85)</td>
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<td></td>
<td>(0.70 &lt; \text{EPC}_m \leq 0.75)</td>
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<tr>
<td>3</td>
<td>(0.60 &lt; \text{EPC}_m \leq 0.70)</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>(\text{EPC}_m \leq 0.60)</td>
<td>A+</td>
</tr>
</tbody>
</table>

**INCENTIVE WEIGHT** Under this criterion incentive weight of 1.5% is awarded for additional efforts on sub-metering for measurement and monitoring of required parameters.
ENERGY [E.2] Overall CO₂ Emissions

PURPOSE To minimize environmental impact of CO₂ emissions and fossil fuel depletion and economic impacts associated with overall energy consumption at construction project.

[i] GUIDELINES This criterion is dedicated to energy consumption and its management on entire construction site. This includes energy use at site offices, canteens, workers’ accommodation (if attached to construction site), any temporary office/accommodation facility at construction site, energy supply equipment (if any), as well as stationary and mobile site equipment (excluding transportation energy sources e.g. trucks) such as batching plants, air compressors, pumps, fans, lifts, street lighting, earth movers, concrete mixers etc.

The contractor is encouraged to reduce CO₂ emissions associated to the overall energy consumption at site under this criterion to achieve higher score. This is based on comparison of site CO₂ emissions with the reference value.

Contractors should adopt best practices for energy conservation, control and monitoring of all energy consuming equipment and facilities on site.

On energy supply-side use energy efficient generators for on-site power sources and give preference to clean fuels and renewable energy sources when available.

On energy demand-side following examples of best practices can be applied, among several others.

• Replace lighting with energy efficient lighting. Select lighting output to match the demand.
• To regulate energy usage in lighting, install automated energy controls for temporary lighting or other systems that are not in continuous use.
• Select appropriate size of pumps and piping systems used for dewatering and other activities. Trim impellers to suit duty points of pumping. Use of variable speed can be made for varying requirements of pumping.
[I] GUIDELINES

• Arrest air leakages from compressed air systems. Minimize the air pressure requirements. Use the air dampening systems.
• Use energy efficient motors, and ensure appropriate selection of motors.

[II] ASSESSMENT

MEASUREMENT

Project shall develop and implement Energy Management and CO₂ Emission Reduction Plan that takes into account measures potential impacts and responsibilities.

Projects shall complete the Energy Calculator to determine the calculated Energy Performance Coefficient (EPC\textsubscript{CO₂}) value based on the weighted average CO₂ emission factor for each energy generation/supply source used on the construction site.

The data and calculation includes:

• Buildings and temporary facilities energy consumption (HVAC, lighting, DHW, and equipment specifications) (kWh);
• Construction site equipment energy consumption (pump, lighting, equipment, and any other energy consumption centers);
• Type of primary energy sources (electricity, oil, gas);
• Share of grid electricity.

The \( \text{EPC}_{\text{CO₂,c}} \) value is calculated based on estimated energy and emission parameters using the following equation.

\[
\text{EPC}_{\text{CO₂,c}} = \frac{\text{CO₂,c}}{\text{CO₂,ref}}
\]

The \( \text{EPC}_{\text{CO₂,m}} \) value is calculated based on energy measurements using the following equation.

\[
\text{EPC}_{\text{CO₂,m}} = \frac{\text{CO₂,m}}{\text{CO₂,ref}}
\]
MEASUREMENT  In these equations:

- $EPC_{\text{CO}_2,C}$: The performance coefficient for overall CO$_2$ emissions based on calculated energy consumption and weighted average emission factor of associated energy sources;
- $EPC_{\text{CO}_2,m}$: The performance coefficient for overall CO$_2$ emissions based on measured energy consumption and weighted average emission factor of associated energy sources;
- $\text{CO}_2,c$: The CO$_2$ emissions based on the calculated delivery of energy of both building and construction site equipment based on weighted average CO$_2$ emission factor for the respective energy source/s during the reporting period;
- $\text{CO}_2,m$: The CO$_2$ emissions based on the measured delivered energy of both building and construction site equipment based on weighted average CO$_2$ emission factor for the respective energy source/s during the reporting period;
- $\text{CO}_2,\text{ref}$: The CO$_2$ emissions based on the calculated delivered energy of both building and construction site equipment with weighted average CO$_2$ emission factor for the respective energy source/s during the reporting period.

- The reference values for the delivered energy for construction site offices are based on the recommended values stated in E1 criterion.
- The reference values for the delivered energy for construction site equipment are based on the reported nameplate power, efficiency, operating hours and load factors.
- The calculator computes the overall CO$_2$ emissions during the reporting period and determines the $EPC_{\text{CO}_2}$.

The EPC rates the construction site energy performance in terms of CO$_2$ emissions, using scoring and bands from A+ to D based on the achieved level.
SUBMITTAL

(I) Submit the Energy Management and CO\textsubscript{2} Reduction Report for entire construction site highlighting measures, responsibilities and training & awareness plan.

The following supporting documents may be submitted:

- Relevant mechanical, electrical, and plumbing (MEP) equipment specifications or data sheets;
- Energy monitoring data;
- Supporting documents (e.g. name plate specifications, emission factors) for installed equipment and systems.

(II) Submit the Energy and CO\textsubscript{2} Performance Calculator indicating all the relevant calculated and measured data.

Supporting documents as indicated above may be submitted.

(III) Submit relevant records for training and awareness generation as planned under GSAS-CMP.
**SCORE** The criterion is assessed using following two different scorings: CO₂ emissions based on energy consumption calculation; and, CO₂ emissions based on energy consumption measurement. The final score for this criterion will be used based upon the pre-decided weights for each scoring.

1. **Calculated CO₂ Emissions**

<table>
<thead>
<tr>
<th>Score</th>
<th>Requirements (EPC\textsubscript{CO₂,c} Value)</th>
<th>EPC Band</th>
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<tbody>
<tr>
<td>0</td>
<td>EPC\textsubscript{CO₂,c} &gt; 1.0</td>
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</tr>
<tr>
<td>1</td>
<td>0.90 &lt; EPC\textsubscript{CO₂,c} ≤ 1.0</td>
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<td></td>
<td>0.85 &lt; EPC\textsubscript{CO₂,c} ≤ 0.90</td>
<td>C+</td>
</tr>
<tr>
<td>2</td>
<td>0.75 &lt; EPC\textsubscript{CO₂,c} ≤ 0.85</td>
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<td>0.70 &lt; EPC\textsubscript{CO₂,c} ≤ 0.75</td>
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</tr>
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<td>3</td>
<td>0.60 &lt; EPC\textsubscript{CO₂,c} ≤ 0.70</td>
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</tr>
<tr>
<td></td>
<td>EPC\textsubscript{CO₂,c} ≤ 0.60</td>
<td>A+</td>
</tr>
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2. **Measured CO₂ Emissions**

<table>
<thead>
<tr>
<th>Score</th>
<th>Requirements (EPC\textsubscript{CO₂,m} Value)</th>
<th>EPC Band</th>
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<td>Pre-requisite met</td>
</tr>
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<tr>
<td></td>
<td>EPC\textsubscript{CO₂,m} ≤ 0.60</td>
<td>A+</td>
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</tbody>
</table>

**INCENTIVE WEIGHT** Under this criterion incentive weight of 1.5% is awarded for additional efforts on sub-metering for measurement and monitoring of required parameters.
FURTHER RESOURCES

Publications:

4. EN 15603, Energy performance of buildings - Overall energy use and definition of energy
5. EN-ISO 13790, Energy performance of buildings - Calculation of energy use for space heating and heating
6. EN 15316-4-6 Heating systems in buildings – Methods for calculation of system energy requirements and system efficiencies, Part 4-6: Heating generation systems, photovoltaic systems
7. EN15377-3 Optimizing for use of renewable energy sources
8. PrEN 15193, Energy performance of buildings - Energy requirements for lighting
10. PrEN 15232, Energy performance of buildings Impact of building automation, controls and building management
11. PrEN 15241, Ventilation for buildings - Calculation methods for energy losses due to ventilation and infiltration in commercial buildings
12. PrEN 15242, Ventilation for buildings - Calculation methods for the determination of air flow rates in buildings including infiltration
WATER [W] The Water category considers the aspects related to water management for domestic and not domestic applications.

IMPACTS Impacts resulting from unsustainable water consumption include:

- Water depletion;
- Human Comfort & Health;
- Water pollution and contamination.

MITIGATE IMPACT Measures that could mitigate environmental impact and lower demand on water include:

- Implementing water conservation practices;
- Specifying efficient fixtures;
- Creating a system for collection and reuse;
- On-site treatment of water.

CATEGORY WEIGHT 14.00%

CATEGORY INCENTIVE WEIGHT 2.00%

CRITERIA INCLUDED

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<tr>
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<td></td>
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<td>3.00%</td>
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<tr>
<td></td>
<td>Measured Domestic Water Use</td>
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<td>3.00%</td>
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<tr>
<td>W.2</td>
<td>Non-Domestic Water Management</td>
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<td></td>
<td>Measured Non-Domestic Water Use</td>
<td>0</td>
<td>3</td>
<td>4.00%</td>
</tr>
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</table>
WATER  [W.1] Domestic Water Management

PURPOSE  To minimize water consumption in domestic applications in order to preserve natural resources and to reduce the burden on municipal supply and treatment systems.

[I] GUIDELINES  Water is an extremely important resource that requires efficient use as regionally and globally there is an increasing stress on water resources and the issue of water management is associated with environmental and geopolitical significance.

A) Water for Domestic Use

The use of water at construction sites for personal needs by employees of the construction site is protected in accordance with local labor laws. The quantity of water used for this purpose amounts for a significant proportion of the total water consumption because it exists throughout the construction process. Therefore, special consideration should be given to monitor the sufficiency as well as efficiency of this usage. The facilities where this type of water consumption occurs are: sanitary, housing, dining, laundry and kitchen facilities. This includes the water consumption at workers’ accommodations only when they are attached to construction sites.

B) Wastage of Water

There can be a number of causes of domestic water wastage such as: negligence of users, inefficient operation of sanitary installations, inappropriate design, leakages and flaws in domestic facilities and lack of maintenance. Furthermore, the use of clean, drinking water for activities which can be done using recycled water, such as for flushing, is also considered wastage.
[II] GUIDELINES C) Domestic Water Efficiency at Construction Sites

The contractor shall consider water efficiency measures for domestic use over the period of the construction works.

- Use the water efficient fixtures such as low flush toilets, vacuum toilet flush systems, dual flush toilets, water-saving valves and fixtures on faucets and showerheads, low flush urinals and occupant sensors
- Use automatic water flow shut-offs, flow-controllers and regulators, electronic sensors, and lever taps on faucets. Dry fixtures, such as composting toilets and waterless urinals, can also be selected to reduce water demand.
- Use low-flow appliances instead of conventional appliances to reduce occupant water consumption.
- Install leak detection systems to quickly and efficiently identify and locate water leakage points.
- Control and monitor the water use at construction facilities. Periodic readings should be taken from all meters and sub-meters (weekly is recommended in most instances). Regular out-of-hours meter readings might also help to detect any leaks or other unwarranted consumptions.
[II] ASSESSMENT

MEASUREMENT

(I) Projects shall develop a Domestic Water Management Plan demonstrating how to conserve water during the construction phase for domestic uses.

(II) Projects shall complete the Domestic Water Management Calculator to determine the domestic water consumption during construction phase based on necessary input parameters.

(III) Projects shall develop Domestic Water Consumption Monitoring Program and input collected data into Water Calculator.

(IV) Projects shall complete the Domestic Water Calculator to determine the cumulative domestic water consumption in temporary facilities, offices, workers accommodation and laundry. To be accounted for construction site water consumption, such facilities should be within the construction site or its boundaries. Cumulative domestic water consumption is determined by several input parameters including:

- Operating hours;
- Facilities types;
- Specifications of plumbing fixtures;
- Measured water consumption.

(V) Based on the specifications of domestic fixtures adopted and inputs for other parameters provided by the project, the Calculator calculates the water consumption for domestic use ($WC_{cal, domestic}$), separately for the facilities of the same type (e.g. site office, cafeteria etc.). The calculated water consumption is compared against the reference value ($WC_{ref, domestic}$) to determine the Water Performance Coefficient ($WPC_{cal, domestic}$).

$$WPC_{cal, domestic} = \frac{WC_{cal, domestic}}{WC_{ref, domestic}}$$
(VI) Based on the overall measurements, the collective domestic water consumption for each type of facility (WC\textsubscript{mea\_domestic}) is determined. The measured water consumption is compared against the reference value (WC\textsubscript{ref\_domestic}) of the facility type to calculate the Water Performance Coefficient (WPC\textsubscript{mea\_domestic}).

\[
\text{WPC}\textsubscript{mea\_domestic} = \frac{\text{WC}\textsubscript{mea\_domestic}}{\text{WC}\textsubscript{ref\_domestic}}
\]

(VII) The following equation applies to each facility. A different reference value will be calculated for each facility.

\[
\text{WC}\textsubscript{ref\_domestic} = A \times \text{Operating Hours} \times \text{Occupants}
\]

A = Specific water consumption of a person determined based on international benchmarks for the given facility (liter/person/hour).

The WPC rates the construction site performance in terms of domestic water use, by using scoring and bands from 0 to 3 and A to D based on the WPC value, which is an indicator of how efficiently water is used as compared to reference water consumption.
SUBMITTALS

(I) Submit Domestic Water Management Report demonstrating water is conserved during the construction phase for domestic uses.

Supporting documents may include the following:

- Documents outlining the water use activities and control measures;
- Awareness program and toolbox samples;
- Photographs and videos as appropriate;
- Facilities and fixtures lists and specifications;
- Monitoring devices, protocols and audit reports;
- Activities schedule and location maps; and,
- Any other supporting documents or evidences that demonstrate the compliance.

(II) Submit Domestic Water Management Calculator and contractors’ review findings and actions taken.

Supporting documents may include the following:

- Fixtures data sheets and specifications;
- Domestic Water consumption data; and,
- Monitoring devices and protocols.

(III) Submit relevant records for training and awareness generation as planned under GSAS-CMP.
SCORE The criterion is assessed using following two different scoring: calculated water consumption; and, measured water consumption. The final score for this criterion will be used based upon the pre-decided weights for each scoring.

1. Calculated Water Consumption

<table>
<thead>
<tr>
<th>Score</th>
<th>Requirements (Value of $WPC_{\text{Domestic}}$)</th>
<th>WPC Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$WPC_{\text{Domestic}} &gt; 0.90$</td>
<td>D</td>
</tr>
<tr>
<td>1</td>
<td>$0.85 &lt; WPC_{\text{Domestic}} \leq 0.90$</td>
<td>C</td>
</tr>
<tr>
<td>2</td>
<td>$0.80 &lt; WPC_{\text{Domestic}} \leq 0.85$</td>
<td>B</td>
</tr>
<tr>
<td>3</td>
<td>$WPC_{\text{Domestic}} \leq 0.80$</td>
<td>A</td>
</tr>
</tbody>
</table>

2. Measured Water Consumption

<table>
<thead>
<tr>
<th>Score</th>
<th>Requirements (Value of $WPC_{\text{Domestic}}$)</th>
<th>WPC Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisite</td>
<td>Domestic Water Management Report demonstrates compliance</td>
<td>Pre-requisite met</td>
</tr>
<tr>
<td>0</td>
<td>$WPC_{\text{Domestic}} &gt; 0.90$</td>
<td>D</td>
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<td>1</td>
<td>$0.85 &lt; WPC_{\text{Domestic}} \leq 0.90$</td>
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<td>3</td>
<td>$WPC_{\text{Domestic}} \leq 0.80$</td>
<td>A</td>
</tr>
</tbody>
</table>

INCENTIVE WEIGHT Under this criterion incentive weight of 1% is awarded for additional efforts on sub-metering for measurement and monitoring of required parameters.
WATER  [W.2] Non-Domestic Water Management

PURPOSE  To minimize water consumption in non-domestic applications during construction in order to preserve natural resources and to reduce the burden on municipal supply and treatment systems.

[I] GUIDELINES  Water is an extremely important resource that requires efficient use as regionally and globally there is an increasing stress on water resources and the issue of water management is associated with environmental and geopolitical significance.

Water For Non-domestic Activities

Water is an important resource for construction, used in various processes throughout the stages of construction. Some of these uses are: dust or landfill suppression, manufacturing of concrete and mortar, curing of concrete, testing of water-proofing, painting and cleaning.

Wastage of Water

There can be a number of causes of non-domestic water wastage during the construction, such as: negligence of users, unqualified workforce, inefficient operation of hydraulic installations, inappropriate design, leakages and flaws in construction facilities/equipment and lack of maintenance.

Non-domestic Water Efficiency at Construction Sites

The contractor shall consider water efficiency measures for non-domestic use with varying intensities over the period of the construction works.
A number of mitigation and management measures can be instigated to control water consumption for non-domestic use. These control measures include the following.

**A) General requirements**

- As a general rule, contractors must ensure that non-mains water sources are utilized to the maximum (wherever it is practical). This includes source of water abstracted from water bodies, the treated waste water network or settlement lagoons on or near the site may provide sufficient quantity/quality of water for a number of water-intensive activities such as dust suppression or wheel washing. While utilizing water in this way it is imperative to make sure that all legal requirements are taken care of first (e.g. ensure that the suitable abstraction license are obtained from the relevant environmental regulator and that the surface water table has adequate levels).

- Ensure all water sources are accurately quantified, mains water being particularly important. This may include installation of sub-meters on any stand-pipes being used.

- Install leak detection systems to quickly and efficiently identify and locate water leakage points.

- Control and monitor water use in construction activities. Periodic readings should be taken from all meters and sub-meters (weekly is recommended in most instances). Regular out-of-hours meter readings might also help to detect any leaks or other unwarranted consumptions.

- Encourage off-site production of concrete since factory conditions allow for maximum measurement precision resulting in less consumption of materials and ensuring reuse of waste. Factory production will also result in less dust on the site reducing the need for site watering and vehicle washing.
[I] GUIDELINES

B) Dust Suppression

- At the construction site, dust suppression is often associated with stockpiles and overlays, site roads and wheel washes. Dust suppression methods range from simple pouring or spraying of water through to the use of bowsers for larger areas (e.g. roads).
- Use the nozzle technology to create a more effective spray pattern for dust suppression.
- Use dust wetting additives, where possible which can contribute to the reduction of water consumption for dust suppression activities. For example, some additives reduce the surface tension of dust suppression water, which increases the time taken for the water to dry out, thus reducing the total volume of water required.
- Limit access to standpipes, hoses, boom sprayers, and other water consuming equipment by properly trained users.
- Ensure that the sustainable approaches have been considered to reduce the amount of water used for watering.
- Ensure that the water collected, filtered or recycled on site is used for watering if possible. Avoid the use of potable water for this purpose.

C) Washing and Cleaning

- Avoid the use of drive-through wheel washing systems as they do not recycle water which results in water waste. The use of a closed loop wheel wash with a settlement tank and water recycling system can improve the water efficiency of wheel washing systems.
- Use waterless wheel cleaning systems option, if possible, that use angled steel grids to clean debris from the wheels.
- For washing out concrete wagons mains pressure hoses with basic spray patterns are water inefficient. One should consider implementing a high-pressure, low-volume efficient spray pattern to reduce water use; or a specially designed sock to cover the chute could be considered as an option to minimize water use, reduce spills and eliminate pollution.
[I] GUIDELINES  D) Water Use During Commissioning

High volumes of water are used during construction of the building envelope, water proofing works and testing, general cleaning of site and high pressure or specialist cleaning. Reduce water consumption through the following.

- Maximize the opportunity of water recycling by advance planning of water use during the commissioning.
- Isolate the water used for building flushing activities as soon as the flush water turns clear to avoid the unnecessary use of water.

[II] ASSESSMENT

MEASUREMENT  (I) Projects shall develop a Non-Domestic Water Management Plan demonstrating how to conserve water during the construction phase for domestic uses.

(II) Projects shall complete the Non-Domestic Water Management Calculator to determine the non-domestic water consumption during construction phase based on necessary input parameters. While doing so, projects will:

- Ensure that all areas of site water consumption are quantified;
- Record site water consumption on a regular basis; and,
- Utilize consumption data to set improvement targets.

(III) Projects shall develop Non-Domestic Water Consumption Monitoring Program and input collected data into Water Calculator.
MEASUREMENT  
(IV) Projects shall complete the Non-Domestic Water Calculator to determine the cumulative non-domestic water consumption in dust suppression, cleaning/washing, irrigation etc. To be accounted for construction site water consumption, such facilities should be within the construction site or its boundaries. Cumulative non-domestic water consumption is determined by several input parameters including:

- Operating hours;
- Facilities types;
- Specifications of plumbing fixtures;
- Measured water consumption.

(V) Based on the specifications of non-domestic fixtures adopted and inputs for other parameters provided by the project, the Calculator calculates the water consumption for non-domestic use ($W_{cal\_non\_domestic}$), calculated separately for facilities of the same type (e.g. site office, cafeteria etc.). The calculated water consumption is compared against the reference value ($W_{ref\_non\_domestic}$) to determine the Water Performance Coefficient ($WPC_{cal\_non\_domestic}$).

$$WPC_{cal\_non\_domestic} = \frac{W_{cal\_non\_domestic}}{W_{ref\_non\_domestic}}$$

(VI) Based on the overall measurements, the collective domestic water consumption for each type of facility ($W_{cal\_non\_domestic}$) is determined. The calculated water consumption is compared against the reference value ($W_{ref\_non\_domestic}$) to calculate the Water Performance Coefficient ($WPC_{cal\_non\_domestic}$).

$$WPC_{cal\_non\_domestic} = \frac{W_{cal\_non\_domestic}}{W_{ref\_non\_domestic}}$$
MEASUREMENT  

(VII) The reference value is based on the reference capacities of plumbing fixtures and operating hours for each facility type during the reported period. The reference value is based on the following equation.

\[ WC_{\text{ref, non-domestic}} = 0.000125 \times f_o \times f_c \times C_{op} \]

In this equation:

- \( f_o \) = Operation factor;
- \( f_c \) = Construction type factor;
- \( C_{op} \) = Construction output during the reported period (in US Dollars).

The WPC rates the construction site performance in terms of non-domestic water use, by using scoring and bands from 0 to 3 and A to D based on the WPC value, which is an indicator of how efficiently water is used as compared to reference water consumption.

SUBMITTALS  

(I) Submit Non-Domestic Water Management Report demonstrating how the water is conserved during the construction phase for non-domestic uses.

Supporting documents may include the following:

- Documents outlining the water use activities and control measures;
- Awareness program and toolbox samples;
- Photographs and videos as appropriate;
- Facilities and fixtures lists and specifications;
- Monitoring devices, protocols and audit reports;
- Activities schedule and location maps; and,
- Any other supporting documents or evidences that demonstrate the compliance.

(II) Submit non-domestic Water Management Calculator and contractors’ review findings and actions taken.

Supporting documents may include the following:

- Fixtures data sheets and specifications;
- Non-Domestic Water consumption data; and,
- Monitoring devices and protocols.

(III) Submit relevant records for training and awareness generation as planned under GSAS-CMP.
SCORE  The criterion is assessed using following two different scoring: calculated water consumption; and, measured water consumption. The final score for this criterion will be used based upon the pre-decided weights for each scoring.

1. Calculated Water Consumption

<table>
<thead>
<tr>
<th>Score</th>
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<th>WPC Band</th>
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<tbody>
<tr>
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<td>WPC\textsubscript{Non-domestic} &gt;0.9</td>
<td>D</td>
</tr>
<tr>
<td>1</td>
<td>0.85 &lt; WPC\textsubscript{Non-domestic} ≤ 0.9</td>
<td>C</td>
</tr>
<tr>
<td>2</td>
<td>0.80 &lt; WPC\textsubscript{Non-domestic} ≤ 0.85</td>
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</tr>
<tr>
<td>3</td>
<td>WPC\textsubscript{Non-domestic} ≤ 0.80</td>
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</table>

2. Measured Water Consumption

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<td>WPC\textsubscript{Non-domestic} &gt;0.9</td>
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</tr>
<tr>
<td>1</td>
<td>0.85 &lt; WPC\textsubscript{Non-domestic} ≤ 0.9</td>
<td>C</td>
</tr>
<tr>
<td>2</td>
<td>0.80 &lt; WPC\textsubscript{Non-domestic} ≤ 0.85</td>
<td>B</td>
</tr>
<tr>
<td>3</td>
<td>WPC\textsubscript{Non-domestic} ≤ 0.80</td>
<td>A</td>
</tr>
</tbody>
</table>

INCENTIVE WEIGHT  Under this criterion incentive weight of 1% is awarded for additional efforts on sub-metering for measurement and monitoring of required parameters.
FURTHER RESOURCES

Websites:

1. Sustainable Construction Simple Ways to Make it Happen, BRE, https://www.bre.co.uk/

Publications:

6. Water Consumption in Construction Sites in the City of Recife/PE, Camilla Pires dos Santos, Simone Rosa da Silva, Cezar Augusto Cerqueira, Civil Engineering Postgraduate Program, University of Pernambuco, Recife, Brazil, 2015.
MATERIALS [M] The Materials category considers the aspects related to reuse, recycling and recovery of materials used for buildings or during construction works.

IMPACTS Environmental impacts resulting from unsustainable material use include:

- Materials depletion;
- Climate change;
- Fossil fuel depletion;
- Air, water and land pollution.

MITIGATE IMPACT Measures that could mitigate environmental impact due to material use include:

- Reusing materials;
- Recycling waste materials on-site to reduce the use of virgin materials;
- Recovery of materials for off-site uses.

CATEGORY WEIGHT 13.00%

CRITERIA INCLUDED

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<td>Recycled Materials</td>
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<tr>
<td>M.3</td>
<td>Materials Recovery</td>
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</table>
MATERIALS  [M.1] Materials Reuse

PURPOSE   To encourage the reuse of building materials, products and structures originated from on/off site in order to reduce waste generation and resources consumption.

[I] GUIDELINES  Diverting waste from landfills involves finding ways to reduce, reuse and recycle. There are many advantages and benefits to waste reduction. Using less raw materials entails using less energy to extract or process virgin materials. Moreover, the need for expensive and environmentally damaging disposal options such as landfills or incineration plants are reduced. Thereby, protecting our environment and amplifying our economic resources.

Salvaged materials are those materials taken from existing buildings and reused in new buildings and developments. Salvaged materials include flooring, paneling, windows, doors, frames, cabinetry, masonry and structural beams and posts. They can be purchased from suppliers or salvaged from existing buildings on/off site.

In cases where the proposed site contains buildings in a usable condition, such buildings as a whole or portion thereof can be used for permanent or temporary purposes.

A number of mitigation and management measures can be implemented to encourage materials reuse. These measures include the following.

a. Ensure that the materials selected for reuse for the Project are of a high quality, have no detrimental environmental or health impacts, and do not hinder construction in any way.

b. Ensure that existing facilities, systems and structures, if possessing adequate conditions, are disassembled, if needed, systematically so that such components can be reused for its intended purpose or any other suitable utilization. As a rule of thumb, systematic deconstruction approach is favored over demolition when acceptable condition of existing materials and structure exist.
[I] GUIDELINES  

c. Reuse of the existing primary structure should not necessitate significant strengthening or alterations to make it structurally viable.

d. Elements that may be harmful to future occupants must be removed.

e. Reused structure associated systems and components to be upgraded as to be more energy and water efficient.

f. Reuse excavated materials for backfilling after appropriate treatment to suit the required purposes.

[II] ASSESSMENT

MEASUREMENT  

Projects shall complete the Materials Reuse Calculator to determine the percent, by cost, of materials reused based on the following measures: the quantity of reused materials; the unit cost of reused material; and, the total cost of project materials.

A description of the material reused, the total quantity of the reused material, and the unit cost of the reused material are entered into the calculator.

The total percentage, by cost, of reused materials is determined by totaling all the reused materials costs and dividing by the total cost for all materials. The criterion is assigned a final score based on the percentage of materials reused.
SUBMITTAL  Submit the Materials Reuse Calculator indicating all relevant data for the different types of materials reused.

Supporting documents may include the following:
- Documents outlining the materials reuse activities and locations;
- Photographs and videos as appropriate;
- Materials list, BOQ, cost sheets and audit reports,
- Activities schedule and location maps;
- Any other supporting documents or evidences that demonstrate the compliance.

SCORE  (CASE A - INHERITANCE)

For a project pursuing this criterion under GSAS Design & Build certification, the percentage of material reuse will be inherited according to the awarded Provisional Certificate (Letter of Conformance – LOC).

(CASE B - NO INHERITANCE)

For a project pursuing this criterion under GSAS-CM only.

<table>
<thead>
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<th>Score</th>
<th>Requirements (% by Cost of Materials Reuse - X)</th>
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</thead>
<tbody>
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<tr>
<td>1</td>
<td>2.5 % ≤ X &lt; 5.0%</td>
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<tr>
<td>2</td>
<td>5.0 % ≤ X &lt; 7.5%</td>
</tr>
<tr>
<td>3</td>
<td>X ≥ 7.5%</td>
</tr>
</tbody>
</table>
FURTHER RESOURCES

Websites:

1. Sustainable Construction Simple Ways to Make it Happen, BRE, https://www.bre.co.uk/


Publications:


MATERIALS  [M.2] Recycled Materials

DESCRIPTION  Encourage on-site materials recycling and the use of recycled materials and materials with recycled content solicited from off-site sources to reduce the need for virgin materials.

[I] GUIDELINES  Use recycled materials or materials with recycled content to reduce the environmental impact of extracting and processing non-renewable and virgin materials. However, recycling requires energy and may have environmental implications when materials go through remanufacture. Therefore, reuse is generally preferred over recycling.

Recycling refers to the removal of items from the waste stream and processing such materials to reshape them into other useful forms. In addition, these processed materials can be used as raw materials in the manufacture of new products.

Demolition, land-clearing and construction (DLC) waste is defined as solid, largely inert waste resulting from the construction, repair, demolition, or razing of buildings, roads and other structures. The term also includes debris from the clearing of land for construction. This waste stream includes, but is not limited to: concrete, brick, gravel, asphalt, gypsum, wood waste, glass, ferrous and non-ferrous metals, soil, trees, and shrubs.

A number of mitigation and management measures can be implemented to encourage the use of recycled materials for building and construction works. These measures include the following.

a. Encourage the collection of recyclable materials such as glass, plastics, paper, cardboard, and metals. Instruct construction workers and facilities users on appropriate recycling procedures to maximize recycling rates.

b. Clearly label the collection and storage space for recycling, making it easily accessible to construction workers, and locate the space in proximity to vehicular access to facilitate collection and transport.

c. Consider the size of equipment and facilities to be used for recycling management, such as compactors and wheeled bins, when allocating and designing the collection and storage spaces.
[II] ASSESSMENT

MEASUREMENT
Projects shall complete the Recycled Materials Calculator to determine the percent, by weight, of materials recycled on site or materials with recycled content sourced from off site.

The costs of recycled materials and materials with recycled contents are summed up and the total values are entered into the calculator to determine the score.

SUBMITTAL
Submit the Recycled Materials Calculator indicating all relevant data for the materials used.

Supporting documents may include the following:

- Documents outlining the materials recycling activities and locations, as well as the use of materials with recycled content;
- Photographs and videos as appropriate;
- Materials list, BOQ, cost sheets and audit reports;
- Activities schedule and location maps;
- Any other supporting documents or evidences that demonstrate the compliance.
SCORE (CASE A - INHERITANCE)

For a project pursuing this criterion under GSAS Design & Build certification, the percentage of recycled materials will be inherited according to the awarded Provisional Certificate (Letter of Conformance – LOC).

(CASE B - NO INHERITANCE)

For a project pursuing this criterion under GSAS-CM only.

<table>
<thead>
<tr>
<th>Score</th>
<th>Requirements (% by Cost of Recycled of Materials - X)</th>
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<tr>
<td>0</td>
<td>X&lt;2.5%</td>
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<tr>
<td>1</td>
<td>2.5 % ≤ X &lt; 5.0%</td>
</tr>
<tr>
<td>2</td>
<td>5.0 % ≤ X &lt; 7.5%</td>
</tr>
<tr>
<td>3</td>
<td>X ≥ 7.5%</td>
</tr>
</tbody>
</table>
FURTHER RESOURCES

Website:


Publications:


MATERIALS [M.3] Materials Recovery

DESCRIPTION To encourage the off-site recovery of materials originated from site in order to minimize the waste taken to landfills or incineration facilities, and reduce demand for virgin materials.

[I] GUIDELINES This criterion is limited to materials which are originated from the Project site itself and recovered for further use or processing off-site. This intends to reduce the disposal of materials at landfills.

Diverting waste from disposal facilities involves finding ways to reduce, reuse and recycle. There are many advantages and benefits to waste reduction including reducing resources consumption, protecting the environment and creating economic value.

The present recovery levels for all waste streams considered (glass, textiles, ferrous metals, paper, cardboard, plastic, non-ferrous metals, aluminum, wood, etc.) are not satisfactory. At present the rate of waste recovery is much lower than international norms. It is also clear that the recovery rate for the reuse and recycling of demolition, land-clearing and construction (DLC) wastes in the region leaves a great deal of room for improvement.

As the low levels of recycling would indicate, there are many barriers to the collection, reuse and recycling of waste materials in the region today. Some of these are material specific, such as the diversity of plastic waste streams. Others, such as a lack of environmental awareness, affect the recovery of all waste streams. Barriers include the following: lack of culture of recycling, cheap & easy disposal, low environmental awareness, infrastructural deficiencies, lack of research, lack of standards, technical obstacles, lack of green public procurement, lack of economic instruments and lack of legislation.

There are five main components or building blocks upon which any recycling framework is based: awareness, information, economic and legislative conditions and infrastructure.
**[I] GUIDELINES**

A strategic approach is required in order to overcome many barriers identified. In addition, all the required elements for a major increase in the recovery and recycling of waste must be put into place and the forces and drivers to achieve this must be managed effectively and proactively. The various stakeholders must be marshalled properly so that each can play their expected role. Specific responsibilities must be identified and the relevant target groups must be assigned these responsibilities, so that a maximum effect is ensured.

A number of mitigation and management measures can be implemented to encourage the recovery of materials. These measures include:

a. Encourage the collection of recyclable materials such as glass, plastics, paper, cardboard, and metals. Instruct construction workers and facilities users on appropriate segregation procedures to maximize collection rates.

b. Arrange for appropriate waste storage areas, depending on the type of waste being stored, with a sufficient number of skips/storage areas for the different types of recovered materials.

c. Identify recovery outlets capable of handling recoverable materials. Summary of potential outlets for waste streams recovery include the following.

- Glass: used in manufacturing of industrial abrasives; glass wool products; construction aggregate; filtration media; landscaping; Portland cement; epoxy binders and ceramic glazes.
- Textiles: used in manufacturing of yarn and fleece; production of synthetic materials; textile hardboards and carpet products.
- Ferrous Metals: sold to merchants and recycled in mills for ferrous manufacture.
- Paper: used in manufacturing of molded fiber packaging; insulation; building board and furniture; paper mill in Ireland.
[I] GUIDELINES

- Cardboard: recycled in mills for cardboard manufacture.
- Plastic: used in manufacturing of several products used in road safety, home gardening, horticulture, building, domestic, entertainment, agriculture, furniture, marine engineering, plumbing and drainage, education, sports, waste industry, transport, office etc.
- Non-Ferrous Metals: including aluminum sold to merchants and recycled in foundries and smelters
- Wood: used in manufacturing of wood-fiber-plastic products; inorganic bonded wood composites; pulp and paper manufacture; etc.

d. Arrange for the transfer and transportation of recovered materials consignments with licensed/recognized Waste Management Contractor (WMC).

e. Develop a waste tracking system using a Waste Transfer Note (WTN) or similar; to confirm that amount of waste to be recycled and/or re-used.

f. Maintain a register of all recyclable materials and transfer methods. The record of waste being transferred shall include date, time, packing, labelling, type of waste and approximate volume of waste.

g. Transport recovered materials to an approved facility for storage, transfer or recycling purposes.
[II] ASSESSMENT

MEASUREMENT

Projects shall complete the Materials Recovery Calculator to determine the percent, by cost, of materials recovered from site and diverted from landfill.

The weights of recovered materials are summed up and the total values are entered into the calculator to determine the score.

SUBMITTAL

Submit the Materials Recovery Calculator indicating all relevant data for the materials used.

Supporting documents may include the following:

- Documents outlining the procedures of handling, collection, storage, and transfer of waste materials;
- Waste tracking system using a Waste Transfer Note (WTN) or similar documentation showing details of recovered materials;
- Photographs and videos as appropriate;
- Materials list, BOQ, cost sheets and audit reports;
- Activities schedule and location maps;
- Any other supporting documents or evidences that demonstrate the compliance.
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<tr>
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<td>2.5 % ≤ X &lt; 5.0%</td>
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<tr>
<td>2</td>
<td>5.0 % ≤ X &lt; 7.5%</td>
</tr>
<tr>
<td>3</td>
<td>X ≥ 7.5%</td>
</tr>
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</table>
FURTHER RESOURCES

Website:


Publications:


**OUTDOOR ENVIRONMENT [OE]**

The Outdoor Environment category considers aspects related to dust control, noise & vibration control, light pollution & visual impact control and odor & VOCs control.

**IMPACTS**

Impacts resulting from ineffective control and design of the outdoor environment include:

- Air pollution
- Human Comfort & Health

**MITIGATE IMPACT**

Measures that could improve outdoor environmental quality include:

- Minimizing the level of dust and fine particulate produced by construction activities;
- Minimizing the amount of noise produced within the area under development;
- Reduce the vibration impacts from equipment used during construction;
- Minimizing light pollution and negative visual impacts during construction works;
- Minimizing odor and reducing level of VOC in air.

**CATEGORY WEIGHT** 16.00%

**CATEGORY INCENTIVE WEIGHT** 2.00%

**CRITERIA INCLUDED**

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OUTDOOR ENVIRONMENT  [OE.1] Dust Control

PURPOSE  To minimize the level of dust and fine particulate produced by construction activities affecting workers and the surrounding environment.

[I] GUIDELINES  Construction activities have the potential to generate significant levels of dust, including fine and course particulate matter. Exposure to high levels of particulate matter can lead to serious health issues for workers involved directly in the construction process as well as people on neighboring sites. Since dust is airborne, it has the potential to escape the site boundary and impact adjacent sites.

A number of mitigation and management measures shall be implemented to contain the dust particles. These control measures include the following: a) watering of construction sites; b) Isolating dust-producing activities; c) Practicing source control measures; d) Controlling the movement of heavy construction equipment; and, e) Implementing a quantitative Dust Monitoring Program.

A) Watering of construction sites

• Spray water on areas of the construction site that produce dust on a regular basis using water tanks and/or any other water delivery method.

• Spray water on construction paths, gravel roads and any other dusty hardscapes to reduce the amount of dust generated due to the movement of construction equipment.

• Ensure that the sustainable approaches have been considered to reduce the amount of water used for watering.

• Ensure that the water collected, filtered or recycled on site is used for watering if possible. Avoid the use of potable water for this purpose.
[I] GUIDELINES  

B) Isolating dust-producing activities

- Isolate the construction activity that is likely to produce significant levels of dust either by distance or through the use of temporary barriers.
- Where possible, locate dust-producing activities away from the site boundary, especially from sensitive receptors.
- Enclose certain activities with temporary sealed barriers to reduce the amount of dust that can be emitted.
- Fence the work areas (particularly those dedicated for cutting of non-structural concrete products), with the fence lined with cloth or fabric (such as green garden type mesh) to minimize dust generation and migration off site.
- Minimize construction activities that will potentially produce large quantities of dust (such as excavation and transfer of surface materials) on windy days, particularly when blowing in the direction of sensitive receptors.

C) Practicing source control measures

- As far as possible, use the mechanical filtration systems at the site of dust producing activities to remove dust particles instantly from the air.
- Ensure that the adequate number of mobile watering units and necessary equipment are available on the construction site.
- Stabilize construction roads with gravel (or similar) immediately after grading.
D) Controlling the movement of heavy construction equipment

Ensure that trucks transporting bulk materials (e.g. dry earth) to/from/within the project site are not overloaded. They shall be covered with a suitable tarpaulin or similar sheet.

- As far as possible, restrict the equipment movement to reduce the frequency of equipment travel.
- Avoid using paths built with compacted dirt, and where possible, use more permanent roadway material such as asphalt.
- Provide road sweeping equipment to clean up any public roadways affected by dust from the works.
- Determine the site of the concrete batching plant appropriately based on prevailing high wind direction and speed. Provide considerable buffer distance from sensitive receivers of dust.
- Control dust generation from the concrete batching plant by installing filter bags at the vents of the silos and provide conveyors and discharge ends with dust-tight covers.

E) Implementing Dust Monitoring Program

The monitoring program shall be performed on and adjacent to the project site (incorporating use of a dust monitor such as a dust deposition gauge or volumetric air sampler) to monitor respirable dust and nuisance dust. It is highly recommended that the background levels of dust concentration as well as dust concentration from construction projects are continuously monitored and data are made accessible to certification body. This can provide trigger data to justify alteration of work practices during periods of high dust generation (such as strong wind periods).
(I) Projects shall develop Dust Control Plan, demonstrating how dust will be minimized and controlled during the construction process.

(II) Projects shall develop Dust Monitoring Program for on-site measurements and data collection using Dust Control Calculator.

On-site measurements shall be undertaken to determine concentrations of particulate matter (PM) in the air surrounding the construction site. High volume air samplers shall be used to measure both fine particles (PM2.5) and coarse particles (PM10) in μg/m3. Measurements shall be taken along each side of the site boundary. Due consideration shall be given to any sensitive receptors located along the site boundary. If adjacent sites have buildings, the measurement point shall be located as close to the buildings as possible. The measurements shall be averaged over 24-hour period during the peak construction activity at each of the three construction stages/phases. Recorded measurement shall be reviewed and actioned by contractor and must be entered into the GSAS Dust Control Calculator to determine the average particulate matter value. GSAS auditors will carry out compliance review of contractor’s dust monitoring data for each construction phase.
MEASUREMENT

Monitor prior to the beginning of the Project construction or during a non-construction activities period to identify the background dust levels. Monitor also during the different construction stages to identify the corresponding dust levels due to Project activities. Repeat the monitoring of the background dust levels if any surrounding/neighboring activities change during the construction stages. The Project shall comply with the applicable limits and shall not exceed them. Applicable legal limit for Qatar for PM10 dust concentration is that it should be equal to or below 150 μg/m3, and applicable GSAS limit for PM2.5 dust concentration is that it should be equal to or below 35 μg/m3. However the legal limit may vary from country to country and region to region. If background dust levels are higher than the applicable limits the project shall not result in further increase of these levels.

Following points should be considered during measurements, monitoring and calculations.

• It should be noted that while increasing the applicable background limit in the context of new construction activities based on measurements, contractor has to justify the duration to which higher limits can be applied, possibly through repeated measurements/monitoring to justify validity of new limit.

• It is recommended to conduct continuous monitoring on pre-decided points to determine the dust concentration of construction project. For background levels, continuous monitoring of the spot not affected by construction site is advisable.
FigureOE.1.1 Plan location of particulate matter measurements

The above diagram presents an example on how the measuring points’ locations are selected on each side of the site boundary based on the shape of site and proximity with neighboring buildings and sensitive receptors. When there is a building adjacent to the site, the measurement point should be taken as close to the building as possible.
SUBMITTAL

(I) Submit Dust Monitoring and Control Report, demonstrating how dust will be minimized and controlled during the construction process.

Supporting documents may include the following:

- Documents outlining methods of dust mitigation on-site;
- Photographs and videos as appropriate;
- Check list and audit reports;
- Activities schedules and location maps;
- Any other supporting document or evidence that demonstrate the compliance;
- Drawings showing the location of on-site measurement points and adjacent receptors;
- Specification, measures and any other supporting documents.

(II) Submit relevant records for training and awareness generation as planned under GSAS-CMP.

SCORE

<table>
<thead>
<tr>
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<th>Requirements</th>
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<tr>
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<td>Dust Monitoring and Control Report demonstrates partial compliance*</td>
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<td>2</td>
<td>Dust Monitoring and Control Report demonstrates compliance with PM10</td>
</tr>
<tr>
<td>3</td>
<td>Dust Control demonstrates full compliance</td>
</tr>
</tbody>
</table>

*Partial Compliance: Dust Monitoring and Control Report covers measures for implementing best practices on dust control only.

INCENTIVE WEIGHT

Under this criterion incentive weight of 2% is awarded for additional efforts on continuous monitoring of required parameters.
FURTHER RESOURCES

Website:

1. National Ambient Air Quality Standards (NAAQS) of the Environmental Protection Agency (http://www.epa.gov/air/criteria.html)


Publications:


OUTDOOR ENVIRONMENT [OE.2] Noise and Vibration Control

PURPOSE
To minimize the level of noise produced by construction activities to protect sensitive receptors in the vicinity and to reduce vibration impacts from construction machinery, plant and vehicles during the construction works.

GUIDELINES
Noise is inherent and generally some noise is unavoidable in most construction activities, with the most prominent noise emissions typically coming from heavy equipment, earthworks, vehicles, generators or tasks (such as jack hammering). This elevates ambient noise levels in areas within a project site for certain periods (especially as noises travelling further at night), which can affect wildlife and the public.

Noise-generating facilities and activities from the proposed development and construction site should not negatively affect the surroundings, including wildlife habitats and noise-sensitive buildings on the site or adjacent sites.

A number of mitigation and management measures shall be implemented to minimize noise pollution. These control measures include the following: a) noise minimization, b) noise control, c) vibration control and d) noise-monitoring program implementation.

On one hand, noise minimization strategy has a focus on reducing noise at source, the noise control strategy on the other hand emphasizes the effective control of already generated noise and reducing its impact upon the recipients.

A) Noise Minimization

• Ensure, as far as possible, that inherently quiet and/or properly silenced equipment are utilized for the construction.
• Ensure that the construction equipment are regularly maintained for noise mitigation and that the silencers of machines and equipment are working properly.
• Require operators to shut down all plants and equipment intermittently, between work periods, or throttled down to minimum idling speed.
[I] GUIDELINES

• Provide adequate guidance and training for operating construction equipments. Careless or improper operation or inappropriate use of equipment such as poor loading, unloading, excavation and hauling techniques can increase noise level.

• Erect, as applicable, appropriate buffers (such as fencing, material stockpiles, site accommodation, building walls or a stand of trees or other suitable vegetation) close to the noisy immovable equipment to absorb the noise.

B) Noise Control

• Restrict noisy activities to daytime and evening periods only, with no night time working permitted unless approval has been granted by the regulatory authority (e.g. 24-hour concrete pours).

• Ensure that the noisy equipment such as concrete batch plants, electricity generators, and water pumps are properly sited and oriented carefully so that noise is properly directed away from receivers.

• Use, as far as possible, noise controls at-source, so that any noisy equipment is suitably enclosed with an acoustic barrier or other noise reducing method. All generator sets and compressors shall be housed in acoustically designed housing, which will be closed at all times when in use.

• Schedule, where practical, the noise generating activities in a way that will not negatively impact the sensitive receptors.
C) Vibration Control

Operation of construction equipment causes varying degrees of ground vibration. It can spread through the ground and diminish in strength with distance depending on the equipment and methods employed. In a construction and operation environment, vibrations usually occur from the movement of vehicles (e.g. heavy trucks, trains, plant) or from construction activities such as demolition or compaction of the soil by depth vibrators (vibro-compaction) during earthworks. Types of vibration on construction sites are:

- Continuous Vibration - Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery); and,
- Intermittent Vibration: Activities that create non-continuous vibration events in an assessment period (daytime / night-time), e.g. nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile-driving, jack hammers and occasional loading and unloading activities.

A number of mitigation and management measures can be instigated to reduce vibration impacts from construction machinery, plant and vehicles. These control measures include the following.

- Locate, where reasonably practicable, vibrating equipment as far from sensitive premises as possible.
- In some instances it is possible to reduce transmitted vibration by cutting a structure to separate site work from sensitive premises. Clearly, it is important to take account of safety and structural issues before carrying out any work of this nature.
- Replace or repair immediately any equipment or vehicles are seen to have an excessive amount of vibration.
- Minimize unnecessary operation of construction machinery (which cause vibrations) through improved efficiency of trips, and reduction of double handling through appropriate placement of stockpiles, haul roads, works depots and work areas.
[II] GUIDELINES D) Noise Monitoring Program Implementation

A program for monitoring noise affecting workers on the project site or adjacent sensitive receptors will be performed on the construction site and on the perimeter of the project. The noise monitoring program will incorporate the use of a noise monitor such as a noise dosimeter or any other noise monitoring equipment to monitor noise levels throughout construction process, during each construction stage specifically when pick activity and high-noise level is expected. It will include the monitoring of the noise generated from equipment and plants used during construction as well as the noise affecting the neighboring areas, especially the sensitive receptors. The noise monitoring can provide trigger data to justify alteration of work practices during periods of high level noise pollution.

Requirements for Noise Levels

a. Noise from equipment & plants

The BS 5228:2009 Part 1 standard or equivalent can be used as a reference for measuring the noise level due to plants and mechanical equipment used during construction. It provides guidance concerning methods of predicting and measuring noise and assessing its impact on those exposed to it.

b. Noise affecting the neighborhood

The noise generated due to the construction activates in the project site may affect the neighborhood (the area around the construction site). The monitored noise shall not exceed the allowable maximum levels stated by the applicable local regulations or recognized international standards.

Moreover, monitor background noise levels prior the beginning of any construction activity to identify the benchmark noise levels of the neighborhood (adjacent roads, construction sites etc.).
[I] GUIDELINES  

E) Requirements for Vibration Levels

Projects should adopt the recommendations given by BS 5228:2009 Part 2 or equivalent for basic methods of vibration control. This part can be used as a reference for measuring vibration and assessing its effects on the environment.


[II] ASSESSMENT

MEASUREMENT  

(I) Projects shall develop Noise and Vibration Control Plan, demonstrating how noise and vibration impacts will be reduced and controlled during the construction process.

(II) Projects shall develop Noise Monitoring Program to monitor the noise emitted from equipment used during construction process and noise affects the neighboring sites and adjacent noise-sensitive receptors.

a) Noise emitted from main equipment and plants:

The noise emitted from main equipment and plants used in the construction site shall be monitored at a standards distance in accordance with the BS 5228:2009 Part 1 or equivalent. The recorded measurements shall be reviewed and actioned by project and shall not exceed the maximum levels allowed by the aforementioned standard.
b) Noise affecting the neighborhood:

On-site measurements shall be undertaken to determine whether the allowable sound levels stated by the local standards have been exceeded by measuring equivalent continuous noise levels (LAeq) at pre-decided measurement points on the site boundary.

Project shall conduct background noise measurements for at least 24 hours, over non-continuous days, from Saturday to Thursday prior to the start of construction activity.

Project noise monitoring equipment shall be used to measure LAeq, Lmax and L10 levels in dBA. Noise monitoring equipment shall be placed along each edge of the site boundary while maintaining a distance of 15 meters from construction activity. Microphones shall be placed 1.5 meters above the ground. L10 levels shall be measured every 20 minutes, for a continuous 24-hour period, during the peak construction activity at each construction stage/phase to ensure that the noise of Project does not exceed the allowable level during the course of work.

Recorded measurements shall be reviewed and actioned by contractor and shall be entered into the GSAS Noise Pollution Calculator to determine the maximum noise level. GSAS auditor shall carry out compliance review of contractor’s noise monitoring data on a construction stage basis.

LAeq values obtained from the measurements shall be compared against the applicable legal construction noise limits. When all noise values for the monitored time period are within the limits, the project shall meet requirements for noise pollution.
The above diagram presents an example on how the measuring point’s locations are selected on each side of the site boundary based on the shape of site and adjacency of neighboring buildings and sensitive receptors. When the site boundary is within 15 meters of construction activity, the measurement point should be as close to the extent of construction activity as possible while maintaining a 15 meter buffer.
SUBMITTAL  (I) Submit Noise and Vibration Control Report, demonstrating how noise is minimized in the construction site and how the workers and the sensitive receptors are protected.

Supporting documents may include the following:
- Documents outlining methods of noise mitigation in the site;
- Photographs and videos as appropriate;
- Check list and audit reports;
- Activities schedules and location maps;
- Any other supporting document or evidence that demonstrates the compliance.

(II) Submit Noise Monitoring Report and Noise Control Calculator including on-site measurements data pertaining to noise from equipment and plants as well as noise affecting the neighborhood.

Supporting documents may include the following:
- Drawings showing the location of on-site measurement points and adjacent receptors;
- Specification, measures and any other supporting documents;
- Photographs and videos as appropriate;
- Any other supporting document or evidence that demonstrates the compliance.

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*Partial Compliance: Noise and Vibration Control Report refers only to main equipment and plants not exceeding allowable noise levels.
FURTHER RESOURCES

Website:


Publications:


2. ISO 1996-2 Acoustics: Description, measurement and assessment of environmental noise- Part 2: Determination of environmental noise levels


11. State of Qatar Executive By-law for the Environmental Protection Law, Decree Law No. 30 of 2002.


OUTDOOR ENVIRONMENT [OE.3] Light Pollution and Visual Impact Control

PURPOSE
To protect sensitive receptors from light pollution and to minimize negative visual impacts during the construction phase.

[I] GUIDELINES
A) Light Pollution

Light pollution refers to the impacts caused by the inefficient, excess or obtrusive use of artificial light. The major sources of artificial light include street lighting, security lamps, vehicle head lamps, advertising and display lighting, floodlights and building illumination. Light pollution competes with starlight in the night sky for urban residents, interferes with astronomical observatories and, like any other form of pollution, disrupts ecosystems.

Reducing light pollution implies many things, such as reducing sky glow, reducing glare, reducing light trespass, and reducing clutter. The method for best reducing light pollution, therefore, depends on exactly what the problem is in any given instance.

In the event that construction activities are required at night, a number of mitigation and management measures shall be implemented to minimize light pollution. These control measures include the following.

a. Position lighting (especially construction floodlights) properly and directing their light more efficiently towards where it is needed.

b. Design light fittings that reduce light emitted upwards. For instance, on advertising hoardings use top-mounted rather than ground-mounted floodlights.

c. Use flat lens (full-cutoff) fixtures to ensure that light is only directed below the horizontal, which means less light is wasted through directing it outwards and upwards.
[I] GUIDELINES

d. Turn lights off using a timer or occupancy sensor or manually when not needed.

e. Use the most appropriate lighting type for a given task. Several different types of light sources exist, each having different properties that affect their appropriateness for certain tasks, particularly efficiency and spectral power distribution.

B) Visual Impact

Visual impacts resulting from a project could be associated with machinery and vehicular use, site fencing, stock piles and landscape alteration.

A number of mitigation and management measures shall be implemented to minimize visual impacts. These control measures include the following.

a. Ensure that vehicles leaving site do not spread mud, soil or dirt onto the public roads. Any mud, soil or dirt which has been spread onto the public roads is to be removed and cleaned promptly.

b. Ensure that the choice of materials for boundary fencing takes into account the surrounding land use. Use a solid fence providing security, safety, visual barrier, and partial acoustic attenuation for sites in or directly adjacent to residential areas. Whereas a chain link or similar fencing is sufficient for sites in more remote areas away from sensitive neighbors or which is adjacent to other construction sites.

c. Minimize solid waste piles on-site, covered with netting or tarpaulin and bounded by hoardings, to minimize their visual impact.

d. Minimize ground disturbance and vegetation removal that could result in visual impacts that produce contrasts of color, form, texture, and line. Designate a “No-intrusion Zone” to maximize protection to existing trees and ground vegetation.

e. Where possible, plan and develop temporary tree nurseries for the transplanted and proposed trees at an early stage to allow small trees to grow during the construction periods. This will serve as visual impact mitigation during construction period.
[II] ASSESSMENT

MEASUREMENT  
Projects shall develop Light Pollution & Visual Impact Control Plan. Demonstrating strategies to minimize the level of light pollution and negative visual impacts during construction works.

SUBMITTAL  
Submit the Light Pollution and Visual Impact Control Report. 

Supporting documents may include the following:

- Documents outlining methods of light mitigation in the site;
- Documents outlining methods of mitigating potential visual impacts in the site;
- Specification, measures and any other supporting documents;
- Relevant external lighting drawings (plans and elevations);
- Relevant lighting manufacturers’ datasheets (including photometric data for individual lighting fixtures).

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*Partial Compliance: Light Pollution and Visual Impact Control Report demonstrates compliance with control of either A) Light Pollution or B) Visual Impact.
FURTHER RESOURCES

Website:


Publications:


OUTDOOR ENVIRONMENT [OE.4] Odor and VOC Emissions Control

PURPOSE To reduce impact on air quality due to odor and toxicity of volatile organic compounds, emanating from chemical products used in construction activities.

[I] GUIDELINES A) Odor Control

Unpleasant odors can arise from specific processes, adversely affecting workers and even residents downwind of the construction site. Odors from construction site activities potentially include a number of sources, such as: inadequately maintained septic tanks or sewage networks; exhaust emissions from vehicles or equipment; and poor waste management (e.g. dumped food waste).

A number of mitigation and management measures can be implemented to reduce air quality impacts from odor. These control measures include the following.

a. Implement avoidance techniques with adequate separation distances between potential odor sources and potential receivers.

b. Provide a metal or hard plastic lid to organic waste (food) containers to ensure that odors do not emanate from the putrefying organic waste. Empty the bins regularly and keep them clean.

c. Long-term storage of wastes shall not be permitted onsite. In addition, for short-term storage, no wastes are to be stored outside designated areas.

d. Keep septic tank lids tightly in place at all times to stop odors emanating from or rubbish blowing into the septic tanks. Avoid any overflow or leakage during emptying the septic tanks.

e. Monitor pipe networks that carry wastewater for any leaks that could cause water with foul odor to escape and buildup a stagnant wastewater pond.
[I] GUIDELINES

f. Smoke generated by bonfires (often when burning waste) is a recognized problem on demolition and construction sites, and this practice is to be strictly prohibited.

g. Supply the appropriate personal protective equipment (e.g. respiratory equipment) to workers when they work with odors, dust and volatile emissions.

B) VOC Emissions

Strong toxic odors can additionally come from volatile emissions from chemical products used in construction works such as floor coverings, paints, adhesives and fillers, especially if they are left uncovered. Volatile emissions are also connected to refueling and maintenance activities. These emissions contribute to the formation of ground-level ozone and fine particulate matter, which form smog. Smog have detrimental effects to humans, plants and animals and even causes property damage through acid rain.

A number of mitigation and management measures can be implemented to control volatile emissions during the construction and operation phase. These control measures include the following.

a. Minimize and properly manage the fuel and chemical storage areas. Adequately, vent and confine closed fuel and chemical storage areas.

b. Ensure proper on-site storage of volatile fuels and chemicals in appropriately sealed containers, e.g. Containers for Control of Substances Hazardous to Health (COSHH Containers), in cool, covered areas with adequate venting.

c. Keep all volatile materials storage containers (e.g. fuels, solvents) closed when not in use.

d. Control the leakage of gases from gas bottles through compliance of instructions of storage of dangerous goods.

e. Maintain a full list of all volatile materials and chemicals stored on site by the site supervisor/ safety in-charge. All aspects of Material Safety Data Sheets (MSDS), including allowable volumes, locations and storage and handling instructions shall also be documented.
[I] GUIDELINES

f. Avoid, if possible, on-site storage of highly volatile fuels such as petrol and volatile chemicals such as solvents and oil-based paints.

g. Control volatile emissions by minimizing leaks and spills of fuel driven engines.

[II] ASSESSMENT

MEASUREMENT

Projects shall develop an Odor and VOC Emission Control Plan to reduce the negative impacts on air quality due to odor and toxicity of volatile organic compounds.

SUBMITTAL

Submit the Odor and VOC Emissions Control Report. The plan shall demonstrate how the negative impacts on air quality from odor and toxicity of volatile organic compounds will be reduced. The documents shall also address how the VOC emissions from chemical products will be controlled.

Supporting documents may include the following:

- Drawings showing the location of septic tanks or sewage networks;
- Documents outlining methods of odor mitigation in the site, including proper waste management strategies;
- A full list of volatile fuels and chemicals stored on site, indicating volumes, locations and Material Safety Data Sheets (MSDS);
- Site plan identifying the proper on-site storage of volatile fuels and chemicals.

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FURTHER RESOURCES

Websites:

1. Sustainable Construction Simple Ways to Make it Happen, BRE, https://www.bre.co.uk/

Publications:

6. Water Consumption in Construction Sites in the City of Recife/PE, Camilla Pires dos Santos, Simone Rosa da Silva, Cezar Augusto Cerqueira, Civil Engineering Postgraduate Program, University of Pernambuco, Recife, Brazil, 2015.
SOCIO-CULTURAL DIMENSIONS [SD] The Socio-Cultural Dimensions category considers the aspects associated with cultural conservation, protection of archeological or heritage sites and society engagement. This category is applicable if any archeological or heritage elements are discovered during the construction works.

IMPACTS Impacts resulting from non-protection of archeological or heritage sites, and ineffective control and design of the Socio-Cultural Interactions include:

- Loss of society well being;
- Loss of cultural heritage;
- Missed opportunity to build mutual trust between society and businesses.

MITIGATE IMPACT Factors that could mitigate impact include:

- Identifying archeological sites to prevent damage by excavation;
- Identifying heritage items or relics for protection against site activities.

CATEGORY WEIGHT 5.00%

CRITERIA INCLUDED

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SOCIO-CULTURAL DIMENSIONS

[SD.1] Protection of Archaeological Sites

PURPOSE
To protect any cultural heritage sites or buried archaeological remains that are discovered on site from damages due to construction activities.

[I] GUIDELINES
Archeological sites are nonrenewable resources; they serve as links for the people and civilizations that flourished in distant past. Development of new buildings and roadways many a times exacerbates the damages on archeological sites. Nonetheless, development cannot be discontinued simply to protect and preserve archeological sites, having an understanding of its impact before development takes place could help protect the sites. Several techniques of restoration, reconstruction, recreation/renovation, and relocation can be used to resist the damage and reinstate the cultural significance of an archeological site.

The potential heritage items or relics on archeological sites can include:

• Evidence of historical occupation (such as aged building remains), fishing or pearling artifacts, ship wrecks, pottery, flint and other tools;
• Evidence of early industrial heritage;
• Articles of religious heritage value; and,
• Items or places of importance to the early Bedouin people.

Protection of archeological sites shall be ensured prior and during construction process, taking into consideration the applicable requirements of governmental and other relevant authorities.
[I] GUIDELINES  A number of mitigation and management measures shall be implemented to protect archaeological sites. These control measures include the following.

a. Carry out the early detection of archaeological constraints before the construction activities start.

b. Implement the specific conditions related to the protection of cultural heritage items from the Environmental Impact Assessment and Environmental Baseline Study, as required.

c. When the heritage items are identified near the work site, clearly mark them with temporary flagging or fencing, prior to the commencement of works.

d. When work is conducted near identified heritage items, create an exclusion zone around the items to prevent damage by excavation, vehicle movement and vibration, resulting from vehicles and equipment.

e. Communicate to all staff, including machinery operators, the possible or confirmed existence of heritage objects or places, and the responsibility to report any suspected heritage discoveries.

f. Report the discovery of any potential heritage items immediately to relevant local governmental authority.
[II] ASSESSMENT

MEASUREMENT
Projects shall develop Archeological Site Protection Plan for protection of any cultural heritage site or buried archaeological remains or relics that are discovered on site from construction activities.

SUBMITTAL
Submit the Archeological Site Protection Report along with the following supporting documents:

- Archeological survey/Archeological Impact Assessment, if applicable;
- Letter of no objection from local and government authorities prior to any work commencing on site (if applicable);
- Documents outlining all important measures to protect the heritage sites from the effects of construction activities;
- Drawings of the areas that are to be protected;
- An archaeological watching brief shall be maintained in-case archaeological discoveries are made;
- Photographic evidences showing artifacts found in the project site, if applicable; and,
- Any other supporting document deemed necessary.

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FURTHER RESOURCES

Publications:

5. Chartered Institute for Archaeologists. CIFA Regulations, Standards and Guidelines.
SOCIO-CULTURAL DIMENSIONS

[SD.2] Socio-Cultural Interaction

PURPOSE To minimize the impact of construction activities on the day-to-day life of users of surrounding lands or the people who enter the construction site.

[I] GUIDELINES Local Community Liaison

a. Notify local residents who may be affected by the work of the nature of the proposed works prior to the commencement of main construction activities in an area, i.e. earthworks, civil engineering or building activities. The communication is required for activities that are likely to result in disruption or disturbance, such as traffic diversions or blocking of access to properties and major works, and, piling and tunnelling near to sensitive receptors. Provide the local residents with a contact name, telephone number and address for directing any enquiries.

b. Set up and co-ordinate a series of communication meetings with major stakeholders and local communities. Collect public views through various engagement processes that would refine the mitigating measures proposed during construction works.

c. Establish a robust action plan with clear roles and responsibilities and timelines to implement outcomes resulting from the public feedback meetings.

d. Ensure that information dissemination and complaints handling plan contains the appropriate action to be taken in response to any non-compliance with approved plans or construction arrangements or in the event of physical damage.
[II] ASSESSMENT

MEASUREMENT Projects shall develop a plan to reduce the negative impact of construction activities to the users of surrounding land areas and local residents.

SUBMITTAL Submit the 'Information Dissemination and Complaints Handling Report'.

Supporting document may include the following:

- Letter of no objection from local and government authorities prior to any work commencing on site;
- Information package shared with community;
- Documents outlining how complaints will be handled properly;
- Communications protocol to liaise with the local communities; and,
- Feedback forms and action plans.

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FURTHER RESOURCES

Websites:

1. Sustainable Construction Simple Ways to Make it Happen, BRE, https://www.bre.co.uk/


Publications:


6. Water Consumption in Construction Sites in the City of Recife/PE, Camilla Pires dos Santos, Simone Rosa da Silva, Cezar Augusto Cerqueira, Civil Engineering Postgraduate Program, University of Pernambuco, Recife, Brazil, 2015.


The Management and Operations category considers aspects related to waste management, welfare facilities, construction health & safety and workers’ accommodation.

**Impacts**
Environmental impacts resulting from ineffective construction site management and operations include:

- Materials Depletion;
- Land Use and Contamination;
- Water Pollution;
- Air Pollution;
- Human Safety, Comfort & Health.

**Mitigate Impact**
Factors that could mitigate environmental impact include:

- Planning and implementing sustainable management of waste;
- Ensuring health and safety of workforce by providing necessary facilities, developing plans and management systems;
- Providing facilities for the welfare of workers and staff on site;
- Promoting clean and safe practices of material management.

**Category Weight** 14.00%

**Category Incentive Weight** 4.00%

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MANAGEMENT AND OPERATIONS

[MO.1] Waste Management

PURPOSE
To plan for the reduction, collection, segregation, storage, composting, and proper disposal of waste.

[I] GUIDELINES
Responsible management of waste is an essential aspect of sustainable construction practices. In this context, managing waste means waste reduction, proper waste collection, waste segregation, waste storage, waste disposal and waste records keeping.

A) Waste Reduction

A number of mitigation and management measures can be implemented to encourage waste reduction. These control measures include:

a. Maintain a tidy site by implementing good housekeeping, which can reduce waste generation;

b. Order materials in bulk, where possible, to reduce packaging;

c. Purchase materials with minimum of packaging waste to dispose of;

d. Re-use as much material on site as possible; and,

e. Organize training programs for workers on waste management.

B) Waste Collection

A number of mitigation and management measures can be instigated to aid waste collection. These control measures include:

a. Waste chutes are often used to transfer waste from vertical constructions to the ground level.

  • Provide enclosed chutes where materials are dropped from height.
  • Provide suitable enclosed protection barriers and warning signs of the hazard of falling materials into the area on which the material is dropped.
GUIDELINES & ASSESSMENT

[I] GUIDELINES

- Do not remove waste materials from the lower area until handling of materials above has ceased.
- Ensure that waste chutes deposit the waste directly into waste skips and do not deposit them on to the ground where waste is uncontrolled.
- Place dust netting or similar around the skip and along the length of the chute to contain any dust clouds upon impact and also to stop any loose waste escaping.

b. Waste Piles

- Do not allow construction debris and demolition material to accumulate such that it presents an environmental, health and/or safety hazard. All such materials are to be disposed off-site.
- Pile only contains passive waste (e.g. wood, metal, plastic, dry concrete) and no food waste, hazardous waste or wastewater.
- If the waste pile contains plastic, paper or other light-weight material it needs to be covered with a net/tarpaulin or similar to stop waste from blowing around.

c. Collect liquid waste, such as greywater, sewage, slurry and other wastewater from source (typically a GRP tank or similar such as a septic tank) by a licensed waste collector and take off-site for disposal at a regulatory authority approved facility.

C) Waste Segregation

a. Sort and segregate waste generated at source to avoid mixing of incompatible waste materials, in accordance with local regulations. Collect toxic and hazardous waste separately and dispose of in accordance with current regulations.

b. Establish a system for segregation for the recyclable materials and other waste on site as it is not permitted to send any mixed waste to governmental disposal grounds.

c. Clearly identify which waste should go in which skip, either with signs/pictures or by color-coding the skips.
(I) GUIDELINES  D) Waste Storage

A number of mitigation and management measures can be instigated to aid waste storage. These control measures include the following.

a. Place an adequate number of containers (skips, bins or similar) throughout the construction areas and temporary facilities.

b. Collect the waste containers regularly and transfer them to the main waste storage area.

c. Containers are to be regularly inspected. Keep the waste receptacles securely closed during accumulation (except for open-topped trash skips) and storage and seal them tightly prior to transportation from the generation area.

d. Ensure that the storage containers are of sufficient size and number to contain all solid wastes generated between collections.

e. Properly store all food waste in containers with closed metal or hard plastic tops to minimize the possibility of vermin infestation or odor emanating.

f. Place a bucket with sand near staff canteen or mess halls, for safe disposal of cigarette butts. Do not leave cigarette butts on the ground as they contain toxins.

g. Store wood separately (either in skip or fenced off area), and do not allow to grow into a large bonfire size, where it could have safety risks.

h. Keep flammable substances away from the sources of ignition.

i. Old tyres are a fire hazard. Do not allow stockpiling of used tyres. Take them to a tyre recycling contractor or landfill for disposal.
[I] GUIDELINES  E) Waste Disposal

A number of mitigation and management measures can be instigated to aid waste disposal. These control measures include the following.

a. Arrange for the transfer and transportation of waste consignments with the regulatory authority approved / licensed Waste Management Contractor (WMC). Before the transportation takes place, the contents, packing, labelling and documentation of the waste should be checked.

b. Waste shall be transported to a disposal facility approved by Regulatory Authority.

c. Cover the vehicles delivering waste to the disposal area where necessary, to prevent dropping, leaking, sifting or blowing of solid waste from the vehicle.

d. Ensure that no waste is burnt on site.

e. Fully contain the waste generated during marine activities, keep on board and dispose of appropriately once ashore. No waste is to be disposed overboard.

f. Ensure that marine vessels with toilet/ablution facilities include a holding tank on board for sewage, and that the holding tank is pumped out only at a designated pump out facilities and by a Regulatory Authority approved facility, but never into the sea.

g. It is prohibited to discharge bilge or ballast water into marine waters. Bilge and ballast waters are contaminated with oil, grease, sewage and other chemicals, and are harmful to the marine environment. Bilge and ballast water is to be stored securely on board the vessel, and then discharged into a port/ marina treatment facility.
[I] GUIDELINES  F) Waste Records

In order to ensure that waste generated throughout the Project is disposed of appropriately, some paperwork is required to assist in the tracking of waste.

a. Proof that waste material is removed from site, but also that it is disposed of appropriately at an approved location and facility.

b. Waste records are also required to confirm that amount of waste being recycled and re-used. A waste tracking system is to be developed using a Waste Transfer Note (WTN) or in similar way.

c. Maintain a register of all hazardous waste and disposal methods. Include in the record of waste being disposed of, the date, time, type of waste and approximate volume of waste.

d. Ensure that these waste records are audited on a regular basis to monitor the quantity and type of waste being produced in order to analyze where improvements can be made in either reducing the quantity of waste being produced or increasing the diversion of waste from the landfill towards re-use or recycling.

G) Hazardous Waste Management

A number of mitigation and management measures can be instigated to aid proper hazardous waste management. These control measures include the following.

a. Provide fire prevention systems and pollution control equipment for storage facilities where necessary, to prevent fires or the releases of hazardous materials to the environment.

b. Do not be use the containers intended for hazardous waste disposal for other purposes unless they are specifically labeled for the intended purpose.

c. Store different types of hazardous waste separately to avoid adverse chemical reactions and eventual accidents.
[I] GUIDELINES  

d. Drain used oil or fuel filters of the residual liquids by placing them on a mesh rack in a tray or drum. Dispose of the drained filter as scrap metal. Collect the drained oil or fuel by a waste oil recycling contractor.

e. Unused liquid paints cannot be disposed of with general waste. Dispose of only completely dried-out paint residue tins/drum with solid waste.

f. Store used batteries on a concreted surface or metal/hard plastic tray. This is due to the acid content. Send used batteries for recycling.

g. Ensure that bentonite fluid mixtures used during piling and other site works are contained. Use appropriate measures to prevent the slurry mixtures spreading to other parts of the site or adjacent works. This can be done using adequate temporary containment barriers placed around the piling bores to prevent lateral spreading of bentonite/cement fluids.

h. Stored hazardous waste separately from non-hazardous waste and away from sources of ignition.

i. Store hazardous waste in tightly closed, leak-proof containers made of or lined with, materials that are compatible with the hazardous waste to be stored. Clearly mark the containers with appropriate warning labels to accurately describe their contents and detailed safety precautions. Ensure that labels are waterproof, securely attached, and written in English, Arabic and other appropriate languages. Wherever possible, chemicals shall be kept in their original container.
[I] GUIDELINES

j. Store and handle hazardous chemicals in accordance with the manufacturer’s Material Safety Data Sheet (MSDS).

k. Relevant spill prevention measures shall be adhered to in accordance with applicable good practices.

l. Maintain a register of all hazardous waste and disposal methods. MSDS shall be consulted by the contractor.

H) Hazardous Waste Classification

Table MO.1-1 below gives an example of the classification of the hazardous waste. It may change depending upon the applicable government regulations.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1</td>
<td>Medical Waste Resulting From Hospitals And Medical Clinics And Centres</td>
</tr>
<tr>
<td>Y2</td>
<td>Waste Resulting From Producing And Preparing Pharmaceutical Products</td>
</tr>
<tr>
<td>Y3</td>
<td>Pharmaceutical Waste, Drugs And Medication</td>
</tr>
<tr>
<td>Y4</td>
<td>Waste Resulting From Producing, Composing And Using Bio-Toxics And Pharmaceutical Vegetal Products</td>
</tr>
<tr>
<td>Y5</td>
<td>Waste Resulting From Producing, Composing And Using Preservatives Of Timber</td>
</tr>
<tr>
<td>Y6</td>
<td>Waste Resulting From Producing, Composing And Using Bio-Solvents</td>
</tr>
<tr>
<td>Y7</td>
<td>Waste Resulting From Thermal Treatment And Mixing Operations That Contain Cyanide</td>
</tr>
<tr>
<td>Y8</td>
<td>Waste Of Mineral Oils That Are Consumed And May Not Be Used For Its Designated Purposes</td>
</tr>
<tr>
<td>Y9</td>
<td>Waste Of Oils, Water, Mixtures Of Hydrocarbons With Water And Emulsions</td>
</tr>
<tr>
<td>Y10</td>
<td>Waste Of Substances And Objects Containing Or Polluted With PCBS And/Or PBBS</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Y11</td>
<td>Waste Of Tar Residual Resulting From The Refining, Distillation And Thermal Treatment Operations</td>
</tr>
<tr>
<td>Y12</td>
<td>Waste Resulting From Producing, Composing And Using Inks, Tinctures, Colors, Paints And Varnish.</td>
</tr>
<tr>
<td>Y13</td>
<td>Waste Resulting From Producing, Composing And Using Resins, Saps, Substances With Added Plastics, Glues And Sticking Substances.</td>
</tr>
<tr>
<td>Y14</td>
<td>Waste Of Chemical Substances Resulting From Unknown And New Researches, Development And Educational Activities With Unknown Impacts On Humans And The Environment</td>
</tr>
<tr>
<td>Y15</td>
<td>Waste With Explosive Nature</td>
</tr>
<tr>
<td>Y16</td>
<td>Waste Resulting From Producing, Composing And Using Photographic Chemicals And Substances Used For Developing Films.</td>
</tr>
<tr>
<td>Y17</td>
<td>Waste Resulting From Treating Metallic And Plastic Surfaces</td>
</tr>
<tr>
<td>Y18</td>
<td>Waste Resulting From Industrial Waste Disposal Operations</td>
</tr>
<tr>
<td>Y19</td>
<td>Metallic Carbonyl</td>
</tr>
<tr>
<td>Y20</td>
<td>Beryllium And Its Compounds</td>
</tr>
</tbody>
</table>

Table M0.1-1 Hazardous Waste Classification
[II] ASSESSMENT

MEASUREMENT

Projects shall develop and implement a Waste Management Plan for the reduction, collection, segregation, storage and disposal of waste materials.

SUBMITTAL

(I) Submit the Waste Management Report.

Supporting documents may include the following:

- Documents and drawings outlining waste prevention and reduction methods, including collection, segregation, storage, disposal of waste.
- Photographs, checklists, inspection reports, etc.
- Documents outlining treatment of hazardous waste, if applicable.
- Documents outlining the approach of transportation and disposal of waste such as declaration, license and third party agreement.

(II) Submit relevant records for training and awareness generation as planned under GSAS-CMP.

SCORE

<table>
<thead>
<tr>
<th>Score</th>
<th>Requirements</th>
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<td>Waste Management Report does not demonstrate compliance</td>
</tr>
<tr>
<td>1</td>
<td>Waste Management Report demonstrates partial compliance*</td>
</tr>
<tr>
<td>3</td>
<td>Waste Management Report demonstrates full compliance</td>
</tr>
</tbody>
</table>

*Partial Compliance: Waste Management Report addresses hazardous waste only.
FURTHER RESOURCES

Websites:

1. Sustainable Construction Simple Ways to Make it Happen, BRE, https://www.bre.co.uk/


Publications:


6. Water Consumption in Construction Sites in the City of Recife/PE, Camilla Pires dos Santos, Simone Rosa da Silva, Cezar Augusto Cerqueira, Civil Engineering Postgraduate Program, University of Pernambuco, Recife, Brazil, 2015.


MANAGEMENT AND OPERATIONS


PURPOSE To ensure the provision of appropriate and adequate welfare facilities for workers and staff.

[I] GUIDELINES Contractor should provide facilities for comfort, food, water, shelter, transport, washing, sanitary and medical assistance of the workers and staff. The welfare facilities and their requirements include the following.

A) Indoor Environment

• Provide a thermally comfortable environment to ensure the comfort and health of building occupants (air conditioning/heating) for all habitable buildings including offices, prayer halls and canteen areas.
• Ensure light levels provided in all areas of construction site in line with best practices for visual performance, comfort and safety.
• Optimize the exposure of day light for interior spaces in order to improve light quality for building occupants.
• Minimize direct or reflected glare within occupied spaces to improve visual comfort for occupants.
• Provide sufficient measures to maintain adequate acoustic quality within various buildings on the construction site.

B) Drinking Water & Washing Facilities

• Provide cooled drinking water in site offices, canteen areas, field rest shelters and at other suitable points and ensure convenient walking distance for workers from a water station. Label drinking water using the applicable languages for construction community.
• Ensure that the water is of ‘wholesome’ quality and free of all contaminants by installing water filters, chlorinators and disinfection units and ensuring that water storage tanks are cleaned and maintained.
• Ensure that every construction site has adequate washing facilities accessible to staff and workers.
• Remove foul air and moisture from the rooms containing washing facilities by providing sufficient exhaust ventilation.
[I] GUIDELINES C) Sanitary Facilities & Pest Control

- Ensure that every site where workers work for sufficiently long duration (say 4 hours) has adequate sanitary facilities.
- Ensure sufficient exhaust ventilation in the rooms containing sanitary facilities to remove foul air and moisture.
- Arrange septic tanks and schedule their emptying on a regular basis to prevent them from overflow. Ensure that septic tanks are of sufficient size/quantity to cope with peak load.
- Ensure that suitable cleaning/disinfecting procedures are implemented in all sanitary facilities, through employment of a dedicated cleaning team.
- Implement pest control measures in all site offices, canteen areas, washing and sanitary facilities. Ensure that pest control measures are appropriate to known/likely pests and carried out by competent persons.

D) Workers’ Transportation

- Ensure that the transport vehicles, either owned or hired by the contractor, are comfortable and well-maintained.
- Ensure that the vehicles follow the regulatory requirements for engines, vehicular emissions and safety.
- Ensure that transport vehicles use environment friendly consumables such as cleaning products, solvents and lubricants.
- Ensure that the water consumption is optimized for bus washing, through various measures.
- Ensure environment friendly disposal or recycling of oil, batteries and other materials.
[I] GUIDELINES  E) Canteen Areas

- Ensure that canteen area is sufficiently sized and all workers and sub-contractors’ workers can be catered to and canteen areas can be approached conveniently by all workers on site.
- Ensure that wherever possible, canteen areas are located within suitable buildings and are away from works areas.
- Canteen areas are to be fitted out with tables and benches. The number of tables and benches should allow for every worker to sit at a table while eating food either collectively or in batches.
- Ensure that suitable cleaning/ disinfecting procedures are implemented in all canteen areas.

F) Medical Facilities

- Provide adequate and appropriate medical provisions (first aid boxes, defibrillator kits, qualified nurse(s) & doctor(s)) based on the number and distribution of workers in accordance with applicable local requirements and licenses.
- Ensure that all workers have a reasonably rapid access to first aid. Provide adequate first aid cover for all locations in case workers are dispersed over a wide area.
- Ensure that first aid staff have completed an appropriate approved course of training, from a recognized nationally or internationally approved organization/trainer.
- Refer all injuries more severe than first aid cases and medical emergencies to appropriate medical control stations.
- Ensure that the locations of first aid boxes and defibrillator kits are clearly signed, and they are positioned for their easy access. Only qualified personnel such as the site nurses are authorized to use the medical equipment.
[II] ASSESSMENT

MEASUREMENT
Projects shall develop and implement a Welfare Facilities Plan for on-site workers and employees.

Projects shall conduct the surveys for respective sample groups from each staff category to measure the level of their satisfaction on the welfare facilities provided. These surveys shall be conducted three times throughout the construction phases, i.e. one survey per construction stage. Satisfaction level is measured by the average % score achieved in the survey.

SUBMITTAL
Submit the Welfare Facilities Report as along with any supporting documentation to demonstrate compliance including but not limited to filled-in survey templates, responses and relevant evidences.

SCORE

<table>
<thead>
<tr>
<th>Score</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Welfare Facilities Report does not demonstrate compliance.</td>
</tr>
</tbody>
</table>
| 1     | Welfare Facilities Report demonstrates compliance. AND
       | A satisfaction level in the range of 50% to 65% is achieved.   |
| 2     | Welfare Facilities Report demonstrates compliance. AND
       | A satisfaction level between 65%-80% is achieved.              |
| 3     | Welfare Facilities Report demonstrates compliance. AND
       | A satisfaction level higher than 80% is achieved.              |
FURTHER RESOURCES

Websites:


Publications:

8. Water Consumption in Construction Sites in the City of Recife/PE, Camilla Pires dos Santos, Simone Rosa da Silva, Cezar Augusto Cerqueira, Civil Engineering Postgraduate Program, University of Pernambuco, Recife, Brazil, 2015.


[MO.3] Construction Health and Safety

PURPOSE
To ensure on-site occupational health and safety of workforce throughout the construction phase and increase the quality of life of staff and construction workers on the site.

GUIDELINES
A construction site poses significant health and safety risks to construction workers and visitors to the site. It is critical for a project to address the management of safety and health issues to provide a safe and healthy environment and avoid any accidents and injuries.

The contractor may choose to implement:

a. An international or national health & safety best practices standard relevant to the construction site; or

b. An in-house health & safety standard and program; or

c. Both of the above, taking best elements from each of them.

In doing so, the contractor will fully abide by the applicable legal requirements. In addition, contractor may take into account the guidelines and best practices mentioned hereunder. A number of mitigation and management measures can be implemented to encourage adoption of health & safety practices on site. These control measures include the following.

a. Before the construction process begins, develop a plan to address the policies and safety issues that will be in place for the entire construction process. The management plan includes which parties are responsible for health and safety related issues on the site.

b. Designate a person on the construction team whose sole responsibility is to identify, correct, and manage safety issues across the entire construction site.
**[I] GUIDELINES**

c. Create an educational program to educate workers and visitors about the potential hazards on the construction site. Also, create a set of policies to outline the ways safety issues are escalated to management teams.

d. Provide the appropriate protective equipment for construction workers and visitors on the site.

e. Require the use of hard hats, protective clothing, eye goggles, gloves, steel-toe shoes, face masks, and ear plugs when necessary.

f. Determine the types of protective equipment that are necessary based on the construction activity taking place. Make this type of equipment readily available for all construction workers and visitors.

g. Limit the exposure of workers and visitors to potentially hazardous contaminants. Control the amount of dust that is emitted into the air during construction activities.

h. Limit the amount of noise that is produced by construction equipment. Refer to the two criteria [OE.1] Dust Control and [OE.2] Noise and Vibration Control for additional measures to limit these two types of hazards.

i. Provide sufficient light to create a safer working environment. Use temporary light sources with bright, white light to allow workers to see their work as well as to avoid any potential hazards. Bright light sources are especially necessary when construction work takes place at night. Ensure that the appropriate construction areas are well lit, but avoid over-lighting the construction site to reduce the impact on adjacent sites.

j. Construct the appropriate barriers and warnings around potential hazards. Use fences, jersey barriers, and take other appropriate measures to keep construction workers and visitors away from holes, uneven terrain, and other hazards.
[I] GUIDELINES  
k. In addition, use brightly colored signs with clearly visible text to call attention to these hazardous areas. Consider the languages that will be used on the signage and include internationally recognized symbols as well.

l. Ensure that any temporary construction structures such as site trailers, scaffolding, and construction barriers are sturdy and safe for continuous use by the construction team.

m. Provide a safe pedestrian pathway across the construction site perimeter for staff and visitors, clearly signed and protected from the vehicles and heavy equipment transportation.

[II] ASSESSMENT

MEASUREMENT  
Projects shall develop and implement a plan to ensure the health and safety of workers and staffs on the construction site.

SUBMITTAL  
(I) Submit a Construction Health & Safety Report as well as any supporting documentation to demonstrate compliance. This may include the following:

- Documents outlining the management and protocols for health and safety strategies associated with the construction process;
- Site plan identifying assembly point, emergency exits, staircases and provision of fire extinguishers, fire alarms;
- Health & Safety reports, incidents log, checklists and inspection reports;
- Evidences from construction site such as photos and records.

(II) Submit relevant records for training and awareness generation as planned under GSAS-CMP.
<table>
<thead>
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<th>Score</th>
<th>Requirements</th>
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<tbody>
<tr>
<td>0</td>
<td>Construction Health &amp; Safety Report does not demonstrate compliance</td>
</tr>
<tr>
<td>1</td>
<td>Construction Health &amp; Safety Report demonstrates partial compliance*</td>
</tr>
<tr>
<td>3</td>
<td>Construction Health &amp; Safety Report demonstrates full compliance</td>
</tr>
</tbody>
</table>

*Partial Compliance: Construction Health & Safety Report refers to adoption of company’s in-house developed health & safety plan.
FURTHER RESOURCES

Website:

Publications:
[MO.4] Workers’ Accommodation

PURPOSE
To ensure that the accommodation provided for the construction site workers for the duration of the entire Project follow the sustainability principles.

[I] GUIDELINES
The contractor should ensure that the accommodation provided to construction site workers should have all the facilities for a comfortable stay, and is built following sustainability principles. The accommodation should be certified under GSAS-Design & Build-Workers’ Accommodation Scheme.

[II] ASSESSMENT

MEASUREMENT
Projects shall ensure that construction site workers live in accommodation that has achieved certification under GSAS Design & Build-Workers’ Accommodation Scheme.

SUBMITTAL
Submit the evidences for GSAS Design & Build certification of the workers’ accommodation.

SCORE

<table>
<thead>
<tr>
<th>Score</th>
<th>Requirements</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>Workers’ Accommodation does not have GSAS Design &amp; Build certification.</td>
</tr>
<tr>
<td>1</td>
<td>Workers’ Accommodation has 1-Star rating under GSAS-Design &amp; Build scheme.</td>
</tr>
<tr>
<td>2</td>
<td>Workers’ Accommodation has 2-Star rating under GSAS-Design &amp; Build scheme.</td>
</tr>
<tr>
<td>3</td>
<td>Workers’ Accommodation has 3-Star or higher rating under GSAS-Design &amp; Build scheme.</td>
</tr>
</tbody>
</table>

INCENTIVE WEIGHT
Under this criterion incentive weight of 4% is awarded for ensuring that the construction site workers live in accommodation that has achieved certification under GSAS Design & Build-Workers’ Accommodation Scheme.
FURTHER RESOURCES

Website:

Publications:
1. GSAS-Design & Build-Workers’ Accommodation Scheme, Version 2.1
A globally recognised symbol of sustainable engineering

The GSAS system awards one of six levels of certifications to projects, from one star to six stars, depending on their environmental and social impact. Assessment can be conducted to certify the project in the design, construction and operations phases.