

Carbon Counting Calculators

Environmental Infrastructure
CEEQUAL, PAS 2080, ICE V3 & GBC
Infrastructure Bespoke Module

This Presentation on GBE:

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 - <https://GreenBuildingEncyclopedia.uk/7P+39287>
- GBC CPD
 - <https://GreenBuildingEncyclopedia.uk/7P+39145>
- Infrapenny Infrapound Sustainable Infrastructure
 - <https://GreenBuildingEncyclopedia.uk/7P+398>
- UN SDG For Railways
 - <https://GreenBuildingEncyclopedia.uk/7P+39377>
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 - other file formats:
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Green or Violet Materials

- Construction/Infrastructure/Rail
 - Are energy, carbon and labour intensive
 - to create and maintain
- Imported materials:
 - High Carbon: Cement, Concrete, precast,
 - High Energy: Reinforcement, steel, copper, other metals
 - Carbon Sequestration: growing aggregates: CBE
 - Biogenic Carbon Sequestration: timber, bio-based materials
 - Revert to timber sleepers: durable Hardwood not treated softwood
 - Fossil Carbon: Asphalt, bitumen (Some fossil carbon)
 - Fossil Carbon: Plastics, hydro-carbons, petro-chemicals
 - High Energy & Emissions: Rail joining chemistry
- Heavy haulage and emissions: concrete, aggregates, soil, steel, green waste:
 - via rail v road?
- Labour Miles: rail v trucks v trucks on rails

Material choices

- In particular OPC cement replacement in concrete (after water, concrete is the most used material)
 - GGBS or PFA: low carbon, Slower set
 - OPC & GGBS or PFA blended cements: normal setting forced on by OPC
- Risks of product or material surreptitious substitution raising the carbon count
- Robust specifications control substitution,
 - Policing the specification is essential
 - Be Proactive about it
 - Get it right first time

Energy and Carbon in Rail

- Energy in use:
 - Energy Efficiency in production
 - Steam generators: lost opportunity? revert to steam trains!
 - Dispersed production: Local to Rail lines, along rail lines: PVs (EU examples)
 - Energy Efficiency in distribution: HV overhead or buried cable 11,000V radiation losses
 - Energy Efficiency in consumption
 - Catenaries? Bottom Rails? 11,000V radiation losses
- Embodied Energy
 - Copper & catenaries, electrical power and communications cables,
 - Steel: rails, signalling cables, steel tube piling
 - Galvanized steel Catenary supports,
- Embodied Carbon
 - Cement, Concrete
 - Fossil carbon: Plastics, Hydro carbons, natural Asphalt, natural Bitumen,
- Sequestered Carbon
 - Biogenic carbon calculations: few opportunities in rail? Acoustic fences in roads
 - Not Fossil carbon
 - Growing aggregates (rounded: not ideal for concrete or rail support)

What New Rail Infrastructure?

- Signaling: Great Western Rail: (done)
- Goods Yards, Train parking Yards
- Logistics Yards: Container handling, Rail to Rail, Road to Rail to Road
- Passenger routes: Increasing capacity
 - Jubilee Line (done)
 - CTRL Channel Tunnel Rail Link to London St Pancras (done)
 - Camb Pboro Bedford St Albans > St Pancras > South Coast (done)
 - HS2 London to North (over budget and open purse) via SSSIs and Afs
 - Cross rail: Queen Elizabeth Line (later still and bankrupt contracts?)
 - Cross rail 2?
- Stations: more platforms, more lines, ease train congestion?
 - Birmingham, London Bridge, Reading, Cambridge, Peterborough
- Rail to Rail Crossings > flyovers: Nuneaton, Cambridge-LKX

What New Road Infrastructure?

- Consolidation centres & pallet services
 - Forced by Lorry driver Working Practices Directive
 - 12,000 lorry drivers too few overnight
 - Brexit: (Temporary?) Lorry parks
 - replacing M2 to Dover parking lanes
- Potholes repairs
- Central reservation barrier improvements (finished)
- Bridge/Flyover load capacity improvements (finished EU wide)
- Digital Technology cable laying (G5)
- Digital mapping below ground services (Ongoing)
- Road improvements? (local to GBE)
 - A604 > A14 (M1/M6 to A1) dual carriageway and lorry laybys
 - A1 > A1M Huntingdon A14 to Peterborough A1
 - A1 to M1 Bedford Bypass
 - A1 upgrades by-passing roundabouts
 - A14: A1 to M11 increase capacity (opened 1 year early)

Green Infrastructure?

- Green Grids
 - Green Spaces and linking corridors
- Blue ribbons
 - Water bodies, SuDS, rivers, canals, dykes,
- Often associated with Grey (Road and Rail) Infrastructure modifications
- Critically important especially with COVID
 - Socially and mentally important places
 - Support Biodiversity recovery

Who is commissioning/Funding Infrastructure/rail?

- Government <80% Rail
 - Network Rail?
- Local Government 10% Rail
- Private: >5% Goods Yards
- Private: 95% Energy: Wind and PV (+Gov. FIT? RHI?)

Source: GBE National Infrastructure and Construction Funding

Who designs and specifies?

- Stations and other buildings:
 - Stararchitects to get planning
 - NF: How heavy are your buildings
 - (ignoring the foundations) (ignoring lightweight buildings overhead > A/C)
 - Asked to leave Architects Declare to carry on designing holiday airports
 - BA: In use impacts, for some decades
 - promoted BRE GOTS before it was scrutinized and found wanting
 - Passivhaus Designers: In use impacts not embodied
 - Embodied Plug in developed and available now
 - ACAN: Championing Embodied Carbon and Use of timber against fire
 - LETT: Championing Energy in use and Embodied Carbon
 - Greenies: WLC Embodied and In Use, as always
- Routes:
 - Civil Engineers
 - Rail Engineers
 - Bridge Engineers
 - Tunnel Engineers
 - Water & Utilities Engineers
 - Landscape Architects
 - Ecologists
 - Archaeologists

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Sustainable Infrastructure?

- Contracts?
 - PFI or PPP (Do they still do them?) Focus on money, lax on spec
 - Superseded by better systems in Scotland
- Carbon targets: Implementation by:
 - Development Control?
 - Planning? Land owners?
 - Building Control? Pending BRADZ
 - Railways England?
 - National Rail Design Standards
 - National Rail Specification?
 - Highways England
 - DoT Standards
 - National Road Specification?
- Guidance
 - Missed opportunity: No promotion just updated and reissued
 - Example recycled content permitted, what about carbon?
 - WRAP's Aggregrain website: no longer funded so gone
 - Earth Exchange website: also gone

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Sustainable Engineering Specification?

- Engineer's use Specification Templates
 - New cover for each job
 - List all materials and techniques Green and Violet
 - Little or no editing to be job specific
 - Rely on drawings to specify which where
 - Permit greener options but do not require it
- Concrete Mixing Plants
 - Have two cement silos
 - OPC & GGBS
 - They save money by blending OPC and GGBS
 - Just enough GGBS so you won't notice
 - OPC drives GGBS hydration to maintain 7 & 28 day strengths
 - Colour difference: Warm grey not cold grey

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Sustainable World & UK?

- UN SDG United Nations 25th Sept 2015
 - 193 world leaders committed to 17 SDGs
 - 17 Sustainable Development Goals by 2030
- Climate and Biodiversity Emergency
 - UK Government Signed up 1st May 2019
 - Local authorities followed suit: without any idea how and little follow up action
- Extinction Rebellion: frustration at lack of action by all governments
- Greta Thunberg's behaviour change campaign
 - Global call to Adults to join
 - Architects Declare: Oct 2019
 - Construction Declare
 - Education Declare
 - Structural & Civil Engineers Declare
 - Interior Design Declare
- Dictatorship Boris:
 - Brexit/Border controls/Irish unrest/Riots
 - Dilute Human Rights
 - COVID Incompetence
 - Ban all Protests no matter how bad he and his projects/actions get

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UN SDG

- United Nations
 - 25th Sept 2015
 - 193 world leaders
 - committed to 17 SDGs
 - Sustainable Development Goals by 2030
- Green Building Encyclopaedia
 - Sustainable Rail UN SDG (Brain Dump) GHS9377
 - <https://greenbuildingencyclopaedia.uk/?p=9377>
- Interreg SusStations Project
 - Environmental Assessment Method
 - Like BREEAM only more Rail
 - <https://greenbuildingencyclopaedia.uk/?p=9377>

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Sustainable Government Procurement

- Water Sector: Gov. driver: TOTEX = CAPEX + OPEX (saving £ms)
 - Other Sector roll out? Nothing happening
- Government Procurement: Post-Brexit:
 - EU Procurement Rules V2: No longer
 - CE mark Essential Requirements
 - Environmental added
 - TC 350 and TC351 rolled out >
 - LCA > EN 15804 > Product Category Rules > Impacts > EPD reports
 - CE mark replaced by UKCA for goods in UK Jan. '21
 - Essential requirements still relevant: but aim at BS5 not ENs
 - GPP Green Public Procurement: Still possible
 - OGC Office of Government Commerce:
 - Gateway Process Reviews:
 - More due diligence than spec?

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UK Government Publishes others join in

- But is anybody in the industry reading?
 - Yes: Librarian or Knowledge Manager
 - No: Everybody else is busy
- UK Government Commitment to Net Zero Carbon 2050
 - Construction 2025: July 2013
 - Committee on Climate Change: May 2019:
 - The Construction Playbook: V1 Dec. 2020
- Infrastructure
 - National Infrastructure Strategy Nov. 2020 CP 329
- Government Soft landings

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UK Government Commitment to Net Zero Carbon 2050

Carbon dioxide (CO2) emissions from the construction industry in the United Kingdom (UK) from 1990 to 2017 (in 1,000 metric tons)

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Construction 2025

- Industrial Strategy: Government and Industry in Partnership
 - Did anybody sign up to this?
- July 2013
- Discounts on top of Constructing Excellence's
 - 10% year on year improvement challenge
- The Construction industry is already effectively bankrupt
 - Supported by supply chain funding MC with 90+ delay on payments
 - And severe mental stress

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The Construction Playbook V1 Dec. 2020

- Sourcing and contracting public works projects and programmes
- 'Build Back Greener'

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Infrastructure

- National Infrastructure Strategy
 - Nov. 2020 CP 329
 - Fairer Faster Greener
 - COVID recovery
 - Decarbonising & Climate Change
 - Adaptation
 - Investment plans
 - Transport
 - Tailpipe emissions
 - EVs infrastructure
 - but RE too?
 - Energy
 - More renewables % in mix
 - Buildings (27m homes)
 - Green homes Grant
 - Withdrawn April 2021
 - Nature for Climate fund
 - 30,000 hectares of new/year
 - To replace HS2 devastation
 - 10 Point plan for Green Industrial Revolution

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London Plan Whole Life-Cycle Carbon Assessment

- ADD2363 August 2019
- Operational emissions
- E.g. Heating, Hot water
- Embodied are not currently measured
- LETI London Energy Transformation Initiative (Campaign for better)
 - Energy & Carbon in use and embodied
 - Public consultation on Future Buildings Standard this week (April 2021)

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Environment Sectors Prepares

- LCA Life Cycle Assessment & EPD Environmental Product Declarations
 - Method: Normalising to EN 15804-2012, over last decade +AMD A1 2013 +AMD A2
 - Sequestered Carbon Method, outside of EN 15804 boundaries
 - Biogenic carbon, EN 16449-2014
 - Manufacturers: 9000 EPDs in market plenty are in construction materials
- LCA is a broader set of impacts, but we must focus on:
 - Embodied carbon, - CAPEX
 - Sequestered Carbon, Biogenic carbon, Timber and Bio-based materials
 - EN 16449-2014 (we might not be in EU but standards are private enterprise in UK)
 - In use carbon, - OPEX
- PEF Product Environmental Footprinting (Future development)
- PAS 2080:2016 Whole Life carbon Assessment
- RICS Carbon Calculation methodology Ed. 1 Nov. 2017
- ICE Inventory of Carbon & Energy V3 Nov. 2019
- CEEQUAL 6 Civil Engineering Environmental Assessment Method

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EN 15804 LCA > EPD Dataset

Figure 1: Life cycle stages and modules used in CEN/TC 350 standards such as EN 15804

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GBC V2 LCA Calculator

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PAS 2080

Guidance Document for PAS 2080

- BSI
 - Publicly Available Specification
 - PAS 2080:2016 Whole Life carbon Assessment
- The Green Construction Board
 - Guidance Document for PAS 2080
 - Managing Whole Life Carbon in Infrastructure
 - Roles and Responsibilities
 - Process
 - Introduction to LCA
 - Case Studies
 - Carbon Measurement Tools
 - Rules for Calculations
 - Sample datasets from many sources

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RICS Whole Life Carbon

- RICS
- Whole Life Carbon Assessment for the built environment
- Calculation methodology
- Edition 1
- Nov. 2017
- Elemental Assemblies
 - Relates to elemental cost plan
 - Relates to: - Soon
 - Not confident this helps
 - Bad Cost planning?
 - Bankrupt industry?
 - Crippled Supply chain?
 - Late payments?
 - Mental Stress prevails?
- GBC does components > elements > whole building calculations

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ICE database

- ICE Inventory of Carbon & Energy
- V3 remains free access
- Nov. 2019
- Many more derived from consistent method LCA
- More Infrastructure & Civils Datasets
- Haulage and transport datasets
- Less Energy datasets
- Update funded by infrastructure:
 - Heathrow, RSSB, EA
- <https://circularecology.com/embodied-carbon-footprint-database.html>

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GBC V2 EE EC SC Calculator

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Highways England Carbon Tool

- Guidance
- July 2020
- Version v 2.3
- Excel On-line tool
- E.g. Schedules for data collection

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GBC V2 Transport datasets

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Life Cycle Analysis of Transport

- Impact of road and rail transport in LCA
- Flights are very carbon and energy inefficient
- Ships are very efficient
- Rail is very efficient
- Road is worse
- Big trucks are better than small vans
- Role of consolidation centres
- Long haul in big trucks or trains
- Pallet services removes many small vehicles off road
- Needs less drivers
- Switch goods to smaller trucks in consolidation centres
- Short haul in small trucks for easy access
- Round robin journeys, site ↔ consolidation centres

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GBC V2 Civils & Infra Datasets

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ISE Carbon tool: Structures

- Institute of Structural Engineers
- The Structural Carbon Tool
- Launched: March 2021: Free to use
- <https://www.istructe.org/Structure/media/Public/TSE-Archive/2021-Setting-carbon-targets-an-introduction-to-the-proposed-SCORS-rating-scheme.pdf>
- Building Structure only
- SCORS:
- <https://www.istructe.org/Structure/media/Public/TSE-Archive/2021-Setting-carbon-targets-an-introduction-to-the-proposed-SCORS-rating-scheme.pdf>
- Embodied carbon:
- <https://www.istructe.org/Structure/media/Public/TSE-Archive/2021-Setting-carbon-targets-an-introduction-to-the-proposed-SCORS-rating-scheme.pdf>
- Sequestered Carbon:
- <https://www.istructe.org/Structure/media/Public/TSE-Archive/2021-Setting-carbon-targets-an-introduction-to-the-proposed-SCORS-rating-scheme.pdf>
- Timber and carbon sequestration.pdf

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Environmental Assessment Methods: Drive change?

- **BREEAM driven via GGIS & Green Book Live**
- Green Guide to Specification
 - Industry average Generic Materials (no incentive to improve)
 - 1200 Readymade Assemblies (probably not what you are doing)
 - Bespoke assessments (BRE take their time)
 - 400 more assemblies added?
- GreenBook Live Products
 - Mostly plastic or bitumen backed carpets
 - BRE EP + EPD once recalculated to EN 15804
- **BREEAM Infrastructure (Pilot)**
- Like all BREEAM Tools
 - it records what you did,
 - not change the way you did it
 - "If not BREEAM could have been greener"
- HS2 destroys easy targets (whilst COVID lockdown hides evidence)
- Many BS2015 Sites of Special Scientific Interest
- Many Ancient Forests
- 400 year old tree felled for a maintenance slip road

09/04/21 • It completely fails on behaviour change

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Infrastructure Environmental Assessment Method: Drive change?

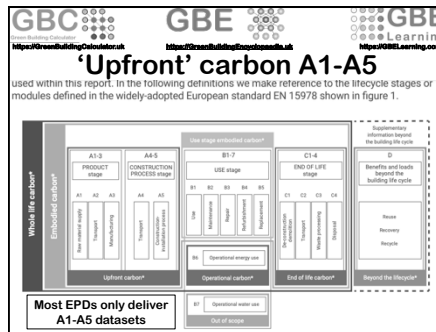
- CEEQUAL V5
- 15 years, 1300 trained assessors,
- now BRE's
- + BREEAM Infrastructure Pilot
- = CEEQUAL 6
- June 2019,
- + Whole Life Carbon
- <https://www.ceequalonline.com/login/>
- Must be trained to use it
- Cannot even see it
- Video: Thank you BRE, link will not work
- Fee: £3000 (£3m)-£38,000 (£1000m)

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World & UK GBC

- WorldGBC Net Zero Carbon Buildings Commitment by 2030 Sept. 2018
- UKGBC Net Zero Carbon Buildings:
 - A Framework Definition: April 2019
- WGBB Bringing Embodied Carbon Upfront
 - Sept. 2019 'Upfront Carbon'
 - disconnecting from OPEX therefore TOTEX
 - Whole live VE becomes more complicated
- Budget March 2021:
 - Government: Build Back Better
 - UKGBC: Build Back Business as Usual
- Net Zero Whole Life Carbon Roadmap for the Built Environment:
 - March 2021

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MEP Services Carbon Accounting

- **BSRIA carbon accounting for services:**
- Rules of engagement
- Topic Guide TG3/2012
- Metals and Plastics
- Sections:
 - duct simplicity
 - cable complexity
- Components & Accessories
- Circuit boards:
 - generic values/mm2

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GBE V2 MEP Services

Items BOMQC EEECS LCA

GBE V2 Sections Calculations

MEP Services & Structures

Profiles XSA Lengths Volumes

What purpose carbon counting?

- Growing designer's awareness of growing impacts
- Carbon reduction potential opportunities and consequences
- Materials decision making
 - More performance
 - Conflicting performances
 - less long term impacts
 - more initial impacts
- As designed v as built
 - Performance Gap
- Substitution Value Engineering
 - Cost cutting in disguise
- Belgium's 2012 ambition
 - 'fine not tax development'
 - Based on designed impacts
 - Not forgetting substitutions

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Project Carbon Accounting

- **CAD & BIM Apps:**
 - ready to interrogate the models and datasets?
- **Or getting ahead of the game**
 - and doing it for yourself in Excel

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Green Building Calculator V2

- Excel for now V1 July 2020; V2 April-May 2021
- Building Elemental Assemblies V1 & V2
- Bill of Materials, Quantities, Costs V2
- Materials EE EC SC datasets & Calculator V2
- Materials and Products LCA Datasets & Calculator V2
- Infrastructure materials Datasets V2
- Transport emissions Datasets V2 Calculator Later
- Services & Structures Sections Calculator V2
- Building Landscape Road Ready-made Assemblies V3 & V4
- Services Design Calculator: Later
- Rail Elemental Assemblies Later needs specialist advice
- Infrastructure Module Calculators V10
 - (sooner if any demand shown, or funded to develop early)
- **BIM App later V20 (but early discussions have started)**

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GBE V2 EE EC SC Calculator

GBE V1 EIU & CIU

GBE V2 BofM Q C

Bill of Materials Quantities Costs

	Area	Material	Unit	Qty	Rate	Cost	Unit	Qty	Rate	Cost
1 Basement Floor (BF)										
1	Concrete	100mm thick	m ²	100	10.00	1000.00	1	100	10.00	1000.00
2	Concrete	150mm thick	m ²	100	15.00	1500.00	2	100	15.00	1500.00
3	Concrete	200mm thick	m ²	100	20.00	2000.00	3	100	20.00	2000.00
4	Concrete	250mm thick	m ²	100	25.00	2500.00	4	100	25.00	2500.00
5	Concrete	300mm thick	m ²	100	30.00	3000.00	5	100	30.00	3000.00
6	Concrete	350mm thick	m ²	100	35.00	3500.00	6	100	35.00	3500.00
7	Concrete	400mm thick	m ²	100	40.00	4000.00	7	100	40.00	4000.00
8	Concrete	450mm thick	m ²	100	45.00	4500.00	8	100	45.00	4500.00
9	Concrete	500mm thick	m ²	100	50.00	5000.00	9	100	50.00	5000.00
10	Concrete	550mm thick	m ²	100	55.00	5500.00	10	100	55.00	5500.00
11	Concrete	600mm thick	m ²	100	60.00	6000.00	11	100	60.00	6000.00
12	Concrete	650mm thick	m ²	100	65.00	6500.00	12	100	65.00	6500.00
13	Concrete	700mm thick	m ²	100	70.00	7000.00	13	100	70.00	7000.00
14	Concrete	750mm thick	m ²	100	75.00	7500.00	14	100	75.00	7500.00
15	Concrete	800mm thick	m ²	100	80.00	8000.00	15	100	80.00	8000.00
16	Concrete	850mm thick	m ²	100	85.00	8500.00	16	100	85.00	8500.00
17	Concrete	900mm thick	m ²	100	90.00	9000.00	17	100	90.00	9000.00
18	Concrete	950mm thick	m ²	100	95.00	9500.00	18	100	95.00	9500.00
19	Concrete	1000mm thick	m ²	100	100.00	10000.00	19	100	100.00	10000.00
20	Concrete	1050mm thick	m ²	100	105.00	10500.00	20	100	105.00	10500.00
21	Concrete	1100mm thick	m ²	100	110.00	11000.00	21	100	110.00	11000.00
22	Concrete	1150mm thick	m ²	100	115.00	11500.00	22	100	115.00	11500.00
23	Concrete	1200mm thick	m ²	100	120.00	12000.00	23	100	120.00	12000.00
24	Concrete	1250mm thick	m ²	100	125.00	12500.00	24	100	125.00	12500.00
25	Concrete	1300mm thick	m ²	100	130.00	13000.00	25	100	130.00	13000.00
26	Concrete	1350mm thick	m ²	100	135.00	13500.00	26	100	135.00	13500.00
27	Concrete	1400mm thick	m ²	100	140.00	14000.00	27	100	140.00	14000.00
28	Concrete	1450mm thick	m ²	100	145.00	14500.00	28	100	145.00	14500.00
29	Concrete	1500mm thick	m ²	100	150.00	15000.00	29	100	150.00	15000.00
30	Concrete	1550mm thick	m ²	100	155.00	15500.00	30	100	155.00	15500.00
31	Concrete	1600mm thick	m ²	100	160.00	16000.00	31	100	160.00	16000.00
32	Concrete	1650mm thick	m ²	100	165.00	16500.00	32	100	165.00	16500.00
33	Concrete	1700mm thick	m ²	100	170.00	17000.00	33	100	170.00	17000.00
34	Concrete	1750mm thick	m ²	100	175.00	17500.00	34	100	175.00	17500.00
35	Concrete	1800mm thick	m ²	100	180.00	18000.00	35	100	180.00	18000.00
36	Concrete	1850mm thick	m ²	100	185.00	18500.00	36	100	185.00	18500.00
37	Concrete	1900mm thick	m ²	100	190.00	19000.00	37	100	190.00	19000.00
38	Concrete	1950mm thick	m ²	100	195.00	19500.00	38	100	195.00	19500.00
39	Concrete	2000mm thick	m ²	100	200.00	20000.00	39	100	200.00	20000.00
40	Concrete	2050mm thick	m ²	100	205.00	20500.00	40	100	205.00	20500.00
41	Concrete	2100mm thick	m ²	100	210.00	21000.00	41	100	210.00	21000.00
42	Concrete	2150mm thick	m ²	100	215.00	21500.00	42	100	215.00	21500.00
43	Concrete	2200mm thick	m ²	100	220.00	22000.00	43	100	220.00	22000.00
44	Concrete	2250mm thick	m ²	100	225.00	22500.00	44	100	225.00	22500.00
45	Concrete	2300mm thick	m ²	100	230.00	23000.00	45	100	230.00	23000.00
46	Concrete	2350mm thick	m ²	100	235.00	23500.00	46	100	235.00	23500.00
47	Concrete	2400mm thick	m ²	100	240.00	24000.00	47	100	240.00	24000.00
48	Concrete	2450mm thick	m ²	100	245.00	24500.00	48	100	245.00	24500.00
49	Concrete	2500mm thick	m ²	100	250.00	25000.00	49	100	250.00	25000.00
50	Concrete	2550mm thick	m ²	100	255.00	25500.00	50	100	255.00	25500.00
51	Concrete	2600mm thick	m ²	100	260.00	26000.00	51	100	260.00	26000.00
52	Concrete	2650mm thick	m ²	100	265.00	26500.00	52	100	265.00	26500.00
53	Concrete	2700mm thick	m ²	100	270.00	27000.00	53	100	270.00	27000.00
54	Concrete	2750mm thick	m ²	100	275.00	27500.00	54	100	275.00	27500.00
55	Concrete	2800mm thick	m ²	100	280.00	28000.00	55	100	280.00	28000.00
56	Concrete	2850mm thick	m ²	100	285.00	28500.00	56	100	285.00	28500.00
57	Concrete	2900mm thick	m ²	100	290.00	29000.00	57	100	290.00	29000.00
58	Concrete	2950mm thick	m ²	100	295.00	29500.00	58	100	295.00	29500.00
59	Concrete	3000mm thick	m ²	100	300.00	30000.00	59	100	300.00	30000.00
60	Concrete	3050mm thick	m ²	100	305.00	30500.00	60	100	305.00	30500.00
61	Concrete	3100mm thick	m ²	100	310.00	31000.00	61	100	310.00	31000.00
62	Concrete	3150mm thick	m ²	100	315.00	31500.00	62	100	315.00	31500.00
63	Concrete	3200mm thick	m ²	100	320.00	32000.00	63	100	320.00	32000.00
64	Concrete	3250mm thick	m ²	100	325.00	32500.00	64	100	325.00	32500.00
65	Concrete	3300mm thick	m ²	100	330.00	33000.00	65	100	330.00	33000.00
66	Concrete	3350mm thick	m ²	100	335.00	33500.00	66	100	335.00	33500.00
67	Concrete	3400mm thick	m ²	100	340.00	34000.00	67	100	340.00	34000.00
68	Concrete	3450mm thick	m ²	100	345.00	34500.00	68	100	345.00	34500.00
69	Concrete	3500mm thick	m ²	100	350.00	35000.00	69	100	350.00	35000.00
70	Concrete	3550mm thick	m ²	100	355.00	35500.00	70	100	355.00	35500.00
71	Concrete	3600mm thick	m ²	100	360.00	36000.00	71	100	360.00	36000.00
72	Concrete	3650mm thick	m ²	100	365.00	36500.00	72	100	365.00	36500.00
73	Concrete	3700mm thick	m ²	100	370.00	37000.00	73	100	370.00	37000.00
74	Concrete	3750mm thick	m ²	100	375.00	37500.00	74	100	375.00	37500.00
75	Concrete	3800mm thick	m ²	100	380.00	38000.00	75	100	380.00	38000.00
76	Concrete	3850mm thick	m ²	100	385.00	38500.00	76	100	385.00	38500.00
77	Concrete	3900mm thick	m ²	100	390.00	39000.00	77	100	390.00	39000.00
78	Concrete	3950mm thick	m ²	100	395.00	39500.00	78	100	395.00	39500.00
79	Concrete	4000mm thick	m ²	100	400.00	40000.00	79	100	400.00	40000.00
80	Concrete	4050mm thick	m ²	100	405.00	40500.00	80	100	405.00	40500.00
81	Concrete	4100mm thick	m ²	100	410.00	41000.00	81	100	410.00	41000.00
82	Concrete	4150mm thick	m ²	100	415.00	41500.00	82	100	415.00	41500.00
83	Concrete	4200mm thick	m ²	100	420.00	42000.00	83	100	420.00	42000.00
84	Concrete	4250mm thick	m ²	100	425.00	42500.00	84	100	425.00	42500.00
85	Concrete	4300mm thick	m ²	100	430.00	43000.00	85	100	430.00	43000.00
86	Concrete	4350mm thick	m ²	100	435.00	43500.00	86	100	435.00	43500.00
87	Concrete	4400mm thick	m ²	100	440.00	44000.00	87	100	440.00	44000.00
88	Concrete	4450mm thick	m ²	100	445.00	44500.00	88	100	445.00	44500.00
89	Concrete	4500mm thick	m ²	100	450.00	45000.00	89	100	450.00	45000.00
90	Concrete	4550mm thick	m ²	100	455.00	45500.00	90	100	455.00	45500.00
91	Concrete	4600mm thick	m ²	100	460.00	46000.00	91	100	460.00	46000.00
92	Concrete	4650mm thick	m ²	100	465.00	46500.00	92	100	465.00	46500.00
93	Concrete	4700mm thick	m ²	100	470.00	47000.00	93	100	470.00	47000.00
94	Concrete	4750mm thick	m ²	100	475.00	47500.00	94	100	475.00	47500.00
95	Concrete	4800mm thick	m ²	100	480.00	48000.00	95	100	480.00	48000.00
96	Concrete	4850mm thick	m ²	100	485.00	48500.00	96	100	485.00	48500.00
97	Concrete	4900mm thick	m ²	100	490.00	49000.00	97	100	490.00	49000.00
98	Concrete	4950mm thick	m ²	100	495.00	49500.00	98	100	495.00	49500.00
99	Concrete	5000mm thick	m ²	100	500.00	50000.00	99	100	500.00	50000.00
100	Concrete	5050mm thick	m ²	100	505.00	50500.00	100	100	505.00	50500.00

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Revisions

Rev	Comment	Date	Author
A00	Prep for GBE page G#39145	14/02/2021	BRM of GBE
A01	Prep for Webinar	08/04/2021	BRM of GBE
A02	Post Webinar update for GBE page	09/04/2021	BRM of GBE

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