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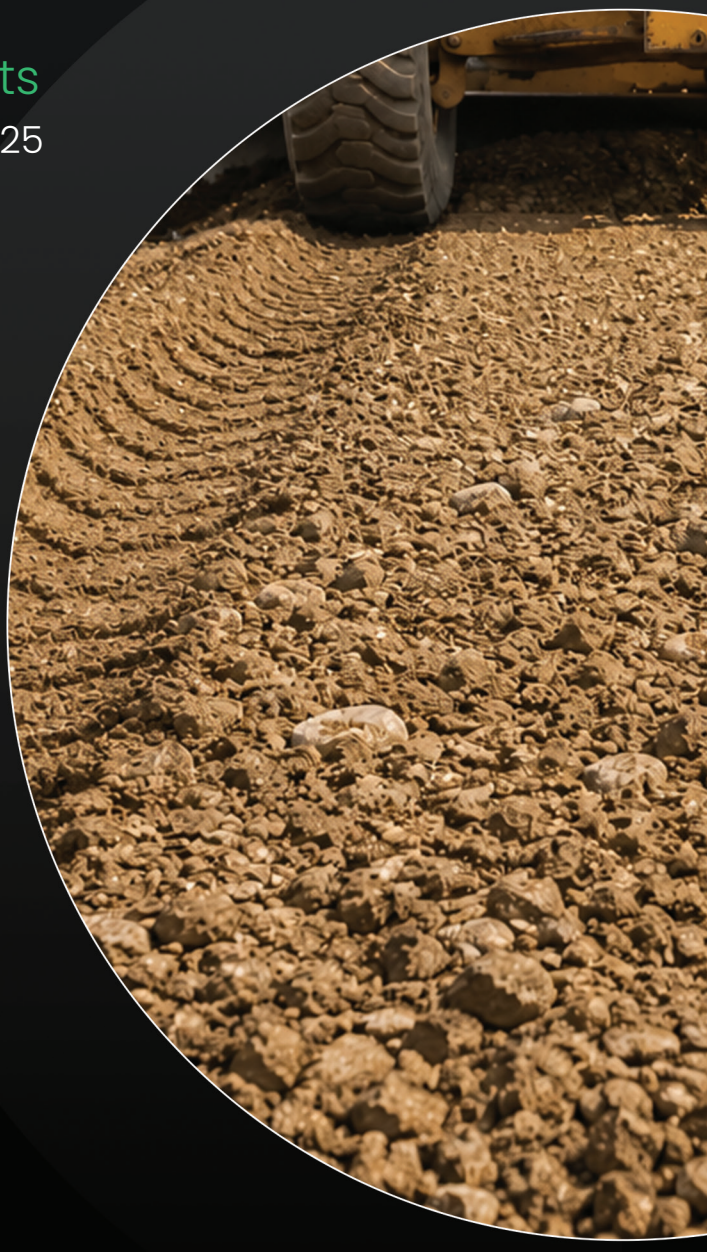
Aggregate from Inert Waste: Resource Framework

Unbound Recycled Aggregate Subbase

Guidance & Testing Requirements

Specification for Highway Works (SHW) 2025
Clause CC 201 (Section 8)
(formerly SHW Series 800)



Applications

- Heavy-duty pavement foundations
- Roads, heavily trafficked infrastructure

Focus

- Performance

SCAPE

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CC 201 Explained

CC 201 is part of the 2025 Specification for Highway Works (SHW) that covers how to construct pavement foundations i.e. the layers between the subgrade (earthworks) and the road base.

CC 201 replaces older prescriptive rules (from Series 600/800) with a performance-based specification aligned with DMRB design standards (CD 225 / CD 226).

CC 201 is responsible for turning prepared ground into a tested, reliable, load-bearing foundation ready for construction.

What CC 201 is responsible for

CC 201 is responsible for ensuring the pavement foundation is properly constructed and proven to perform. This includes:

- Building the foundation layers
- Checking the ground (subgrade)
- Controlling construction
- Delivering performance
- Setting levels and tolerances
- Testing and proving compliance

Where CC 201 fits in the SHW

Within the 2025 SHW structure, CC 201 builds the foundation layers (capping and subbase).
It sits directly above earthworks and below the specifications for pavement layers.

How CC 201 differs from SHW Series 600

Series 600 approach

- Shapes the ground (earthworks, cut/fill, ground improvement)
- Create a stable formation level for works
- Specifies what to use and where

CC 201 approach (2025)

- Building the structural base
- Provides a load-bearing foundation
- **Specifies what performance level to achieve**

Summary:

Series 600 governs earthworks and formation preparation, while CC 201 governs the construction and performance verification of the pavement foundation layers built above that formation.

Aspects of CC 201 (high-level)

1. Purpose

CC 201 defines:

- How to construct and verify pavement foundations
- Ensure a stable, load-bearing platform

2. Scope

CC 201 gives clear requirements for foundation layers above formation level.

- Capping, both bound and unbound
- Sub-base
- Foundation surface

3. Construction Controls

- Layer thickness
- Compaction
- Moisture control
- Surface levels and tolerances

4. Performance Requirements

Foundation requirements must achieve:

- Strength
- Stiffness
- Load distribution capability

*Focus is on what it **does**, not what it is.*

5. Testing and Verification

Mandatory proof of performance is required via:

- Compaction tests
- Thickness checks
- Stiffness testing

No proof means non-compliance and rejection.

CC 201 and Recycled Aggregates

CC 201 explicitly allows recycled aggregates, especially in unbound capping and subbase layers. They are treated the same as natural materials, provided they meet specification and performance requirements.

Where recycled aggregates are used under CC 201 Section 8:

Under CC 201Section 8, recycled aggregates are **typically used in the pavement subbase layers.**

Common acceptable uses:

1. Unbound subbase
2. Hydraulically Bound Subbase (HBM)
3. Stabilised Subbase (cement/lime treated)

Where recycled aggregates are NOT normally used under CC201 Section 8:

Under CC 201 Section 8, recycled aggregates are **not permitted** when they fail:

- Material specification tests
- Material performance requirements
- Environmental contamination/content tests

What CC 201 Section 8 expects from recycled aggregates

Under CC 201 Section 8, recycled aggregates are fully acceptable if they perform to the same strict requirements as natural aggregates.

1. Meet full performance-based requirements

- Deliver the required stiffness
- Contribute to the Target Foundation Class (F1-F4 under CD225)
- Perform adequately under trafficking and loading

Recycled aggregates must achieve the required foundation performance, not just comply with a grading.

2. Consistent and well-controlled materials

- Must be uniform in composition
- Free from variability typically associated with mixed demolition waste
- Produced under **Factory Production Control (FPC)**

They must have:

- Traceable origin
- Documented processing
- Reliable, repeatable properties

*In effect they must be a **processed product**, rather than simply a site-won waste.*

3. Comply with strict material quality limits

Recycled aggregates must meet the same materials standards as natural aggregates, including physical properties.

4. Be free of deleterious materials

Recycled aggregates should contain minimum levels of:

- Wood, plastic and glass
- Gypsum/plasterboard
- Clay lumps, asphalt fragments or weak particles

Excess deleterious material causes reduced durability and leads to material rejection.

5. Achieve frost resistance

Recycled aggregates must:

- Not be susceptible to frost
- Have controlled fines and moisture behaviour

Recycled aggregates must not retain excessive water or break down under freeze/thaw cycles.

6. Be suitable for construction and compaction

Recycled aggregates are expected to:

- Compact to required density
- Maintain layer thickness and integrity
- Not degrade excessively under rolling

Recycled aggregates must have controlled moisture levels and be stable during placement.

7. Pass in-situ verification testing

This is critical under Section 8. Recycled aggregates must pass:

- Stiffness testing (LWD, FWD or plate load)
- Density/compaction tests
- Surface regularity and level tolerances

Acceptance is based on in-situ performance on site, not just on lab results. Please note that this is outwith the scope of the Resource Framework and is only referenced here for guidance on the whole construction process.

8. Be compatible with ground conditions

Recycled aggregates are expected to:

- Not react adversely with subgrade soils
- Be suitable for local chemical conditions e.g. sulphate
- Comply with additional testing requirements or use restrictions if the ground is chemically aggressive

9. Contribute to a durable pavement foundation

Recycled aggregates are expected to:

- Provide uniform load distribution
- Protect the subgrade
- Ensure long-term pavement performance

Recycled aggregates must behave as a structural layer, not just a fill material.

Recycled Aggregates: What CC 201 Section 8 DOES NOT allow

- Contaminated
- Poorly processed or inconsistent
- Contain excessive deleterious materials
- Outside grading limits

- Frost-susceptible
- Unable to be compacted properly
- Failing stiffness/performance tests
- Environmentally incompatible
- Excluded by project specification
- Uncertified or untraceable

Summary:

CC 201 Section 8 does not allow recycled aggregates that introduce risk to pavement performance, durability or compliance. Recycled aggregate use is permitted provided the material behaves like an engineered subbase layer rather than a waste.

Mandatory Tests for Recycled Aggregates (Section 8)

For SHW 2025 CC 201 (Pavement Foundation Construction), recycled aggregates used in capping, sub-base, and foundation layers must meet a combination of:

- Classification tests (what the material is made of)
- Physical/mechanical performance tests (how it behaves)
- Chemical/environmental compliance tests
- In-situ performance verification (installed performance)

Below is a **practical, audit-ready list of mandatory, critical tests** aligned to SHW / BS EN standards and how they are typically applied under CC 201 Section 8.

Material Classification

1. Unbound material classification and suitability

Test	Standard
Particle Size Distribution (PSD)	BS EN 933-1
Fines content	BS EN 933-1
Crushed or broken and totally rounded particles	BS EN 933-5

1. Unbound material classification and suitability (continued)

Test	Standard
Plasticity Index	BS 1377-2
Recovered bitumen content (Type 4 Subbase)	BS EN 12697-1

Purpose:

- Establish of material classification and properties.

2. Aggregates subbase compliance

Test	Standard
Resistance to fragmentation (LA test)	BS EN 1097-2
Magnesium sulphate soundness	BS EN 1367-2
Water absorption/density	BS EN 1097-6
Frost Heave	BS EN 1367-1

Purpose:

- Establish aggregate quality and durability.

3. Chemical Testing (Critical for Recycled Aggregates)

Always required for recycled aggregates under CC 201.

Test	Standard
Water soluble sulphate (mg/l)	BS EN 1744-1
Total sulphur	BS EN 1744-1
Acid soluble sulphides	BS EN 1744-1
Oxidisable sulphide content (OS) (%SO4)	BS EN 1744-1

Purpose:

- Proves that recycled aggregates are clear from sulphates which may have impacts on foundation performance or structure.

4. Constituent Content (Recycled Aggregate Quality)

Required to confirm acceptable recycled material composition.

Test	Standard
Constituents of coarse recycled aggregate (concrete, masonry, asphalt, etc.)	BS EN 933-11

Purpose:

- Quantifies percentage concrete, masonry, asphalt, glass, wood, plastics.

Summary

Section 8 is the **compliance gate** of CC 201. You must **test, measure and prove** that the foundation layer delivers the required strength, stiffness and build quality before progressing to the pavement layer.

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