> **Quick Summary:** MoRTH Table 400-12 specifies the **physical requirements of coarse aggregates** used in **Wet Mix Macadam (WMM)** for sub-base and base courses. Los Angeles Abrasion ≤ 40%, Aggregate Impact Value ≤ 30%, and combined Flakiness + Elongation ≤ 35%. These limits ensure strong, durable, and well-interlocked aggregate structure for long-lasting pavement performance. Read full details →

Scope

This work consists of laying and compacting clean, crushed, graded aggregate and granular material premixed with water to a dense mass on a prepared Granular Sub Base (GSB). Material shall be laid in one or more layers to lines, grades and cross sections shown on approved drawings or as directed by the AE.

- **Minimum single compacted layer thickness:** 75 mm.
- **Permissible single compacted depth with approved vibrating/compaction equipment:** up to 200 mm (with AE approval).

References

1. Contract Agreement
2. IRC: SP: 84-2014
3. Ministry of Road Transport & Highways — MoRTH (5th Revision)
4. Relevant drawings

Materials

1. Aggregates

A) Physical Requirements

Coarse aggregates shall be crushed stone. If crushed gravel/shingle is used, at least **90% by weight** of pieces retained on 4.75 mm sieve shall have at least two fractured faces. Aggregates shall meet the physical requirements shown in **Table 400-12 (MoRTH)** below.

B) Grading Requirements

Aggregates shall conform to the grading limits in **Table 400-13 (MoRTH)** below.

2. Provision for lateral confinement

Provide lateral confinement by laying adjoining shoulders together with the WMM layer and follow the sequence in Clause 404.3.3 to prevent lateral spread during compaction.

3. Preparation of mix

Prepare WMM in an approved mixing plant with controlled water dosing and forced mixing (pug-mill or pan). Plant features shall include:

- Minimum four-bin cold feeders with variable speed drives
- Vibrating screens to remove oversize
- Conveyor belt
- Controlled water addition system
- Forced/positive mixing (pug-mill or pan mixer)
- Centralized control panel and safety devices

Optimum moisture: Determine per IS:2720 (Part 8) after replacing fraction retained on 22.4 mm with 4.75–22.4 mm fraction. Allow for evaporation — moisture at compaction must not vary from optimum beyond agreed limits. Ensure uniform wetting and no segregation.

MoRTH Tables (Integrated)

Table 400-12 — Physical Requirements of Coarse Aggregates (WMM)

Table 400-12: Physical Requirements of Coarse Aggregates for WMM (Sub-base / Base)

S. No.	Test	Test Method	Requirement
1	Los Angeles Abrasion value or Aggregate Impact Value	IS:2386 (Part-4) or IS:5640	Los Angeles Abrasion ≤ **40%** (Max.) Aggregate Impact Value ≤ **30%** (Max.)
2	Combined Flakiness and Elongation Indices (Total)	IS:2386 (Part-1)	≤ **35%** (Max.) *(combined value)*

Download Table 400-12 (PDF)

Table 400-13 — Grading Requirements of Aggregates (WMM)

Table 400-13: Grading Requirements of Aggregates for WMM

IS Sieve Designation	Percent by weight passing
53.00 mm	100
45.00 mm	95–100
26.50 mm	—
22.40 mm	60–80

IS Sieve Designation	Percent by weight passing
11.20 mm	40–60
4.75 mm	25–40
2.36 mm	15–30
600 micron	8–12
75 micron	0–5

Note: Material finer than 425 micron shall have Plasticity Index (PI) ≤ 6. The final gradation within these limits shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa.

📄 Download Table 400-13 (PDF)

Table 900-3 — Frequency of Tests for WMM (Quality Control)

Table 900-3: Frequency of Tests for Control of Quality of Materials and Works — WMM

S. No.	Item of Work	Test	Frequency
4)	Wet Mix Macadam (WMM)	i) Aggregate Impact Value	One test per 1000 cu.m of aggregate
		ii) Grading of Aggregate	One test per 200 cu.m of aggregate
		iii) Combined Flakiness & Elongation Indices	One test per 500 cu.m of aggregate
		iv) Atterberg Limits (portion passing 425 μ)	One test per 200 cu.m of aggregate
		v) Density of compacted layer	One set of three tests per 1000 sq.m

📄 Download Table 900-3 (PDF)

📥 Download Full WMM Methodology (All Tables PDF)

Spreading of Mix

Immediately after mixing, spread the uniformly mixed aggregates on the prepared sub-base. Do not dump heaps on the area or haul over partially completed stretches. Use a self-propelled paver finisher with:

- Loading hoppers and distribution system for continuous flow
- Hydraulically operated telescopic screed (up to 8.5 m) or fixed screed (>8.5 m) with tamping & vibration

- Automatic electronic leveling to control mat thickness and cross slope

If paver is not feasible, a motor grader may be used with AE approval. Check surface with templates, correct high/low spots, and ensure no segregation. Manual mixing/laying may be allowed for small/remote jobs with Engineer approval.

Compaction

Compact uniformly after laying to required thickness and cross-fall:

- For single compacted layer ≤ 100 mm — smooth wheel roller (80–100 kN)
- For single compacted layer up to 200 mm — vibratory roller (min static 80–100 kN) with adjustable frequency & amplitude
- Roller speed shall not exceed **5 km/h**

Setting & Drying

After final compaction, allow the WMM course to dry for **24 hours** before permitting construction traffic (no regular vehicular traffic allowed).

Quality Control & Surface Finish

Quality control shall be exercised by the Engineer per **Section 900** (MoRTH). Surface finish should conform to Clause 902. Retain test certificates and mix trial records for audit and acceptance.

Rectification of Surface Irregularities

If surface irregularity exceeds permissible tolerance or layer is contaminated with sub-grade soil, scarify full thickness over the affected area, reshape or replace with fresh premixed material and re-compact per Clause 406.3. Area treated shall be at least **5 m long × 2 m wide**. Do not fill depressions with unmixed/ungraded fines.

References: IRC: SP:84-2014; MoRTH Specification (5th Revision); IS:2720 (Part 8); Contract Documents.

Quick Reference: Wet Mix Macadam (WMM) Quality Control

- **Applicable Clause:** MoRTH 5th Revision, Clause 406 (Wet Mix Macadam)
- **Layer Thickness:** Compact each layer to a thickness of **75–200 mm**; if thicker, construct in two or more layers.
- **Grading Requirements:** Follow **MoRTH Table 400-13** — continuously graded aggregate mix for Grading I, II, or III.
- **Material Properties:** Los Angeles Abrasion ≤ 40%, Combined Flakiness & Elongation ≤ 35%, Plasticity Index (passing 425 μ) ≤ 6%

- **Mixing & Moisture:** Mix aggregates with water at **Optimum Moisture Content (OMC)** ±1% in a mechanical mixing plant; ensure uniform moisture and prevent segregation.
- **Compaction:** Achieve minimum **98% of Maximum Dry Density (MDD)** using a vibratory roller (80–100 kN static weight).
- **Surface Tolerances:** Longitudinal level ±15 mm, Cross slope ±0.3%, Evenness ≤12 mm per 3 m straightedge (MoRTH Table 900-1).
- **Quality Control Frequency (Table 900-3):** Grading – 1 test/200 m^3, Impact Value – 1 test/1000 m^3, Flakiness/Elongation – 1 test/500 m^3, PI (425 μ) – 1 test/200 m^3, Field Density – 3 tests/1000 m^2.
- **Testing Standards:** IS:2386 (Part 1–4), IS:2720 (Part 8 & 28), and IS:5640 for impact/abrasion tests.
- **Precaution:** Avoid excessive water, segregation, or delayed compaction; ensure continuous rolling until required density is achieved.

Top 10 FAQs – Wet Mix Macadam (WMM)

1. **What is Wet Mix Macadam (WMM)?** WMM is a base layer in flexible pavement construction made of well-graded aggregates mixed with water and compacted to achieve a dense mass, as per MoRTH Clause 406.
2. **What is the purpose of the WMM layer?** It provides a strong, stable, and well-drained foundation for bituminous layers like DBM and BC, distributing traffic loads evenly.
3. **What materials are used for WMM?** Crushed stone aggregates meeting MoRTH Table 400-13 grading requirements and having Los Angeles Abrasion ≤ 40%, combined flakiness and elongation ≤ 35%.
4. **What are the grading requirements for WMM?** WMM aggregates should conform to the specified sieve limits (Grading I, II, or III) of MoRTH Table 400-13. The final gradation should be continuously graded from coarse to fine.
5. **What is the optimum moisture content (OMC) for WMM?** OMC is determined from the modified Proctor test (IS:2720 Part 8). Proper moisture ensures full compaction and stability during rolling.
6. **How is mixing done for WMM?** Mixing is carried out in a mechanical mixing plant with controlled addition of water, ensuring uniform moisture content and aggregate distribution.
7. **What is the compaction requirement for WMM?** Compaction should achieve a minimum of **98% of MDD** (Modified Proctor), using a vibratory roller as per MoRTH Clause 406.3.5.

8. **What are the key quality control tests for WMM?** - Aggregate Impact Value (1 test per 1000 m^3) - Grading of Aggregate (1 test per 200 m^3) - Flakiness & Elongation Indices (1 test per 500 m^3) - Plasticity Index of 425 µ passing fraction (1 test per 200 m^3) - Field Density (3 tests per 1000 m^2) as per MoRTH Table 900-3.
9. **What is the allowable tolerance in surface levels for WMM?** Longitudinal level: ±15 mm and Cross slope: ±0.3%, as specified in MoRTH Table 900-1.
10. **What is the minimum layer thickness for WMM?** Each compacted WMM layer should not exceed 200 mm. For thicker layers, construction must be done in multiple lifts with proper bonding.

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*Prepared by **Kishor Kumar** | Source: HighwayQualityTest.com*

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3️⃣ Wet Mix Macadam (WMM) Construction Methodology
4️⃣ Prime Coat Application Methodology
5️⃣ Tack Coat Application Methodology
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