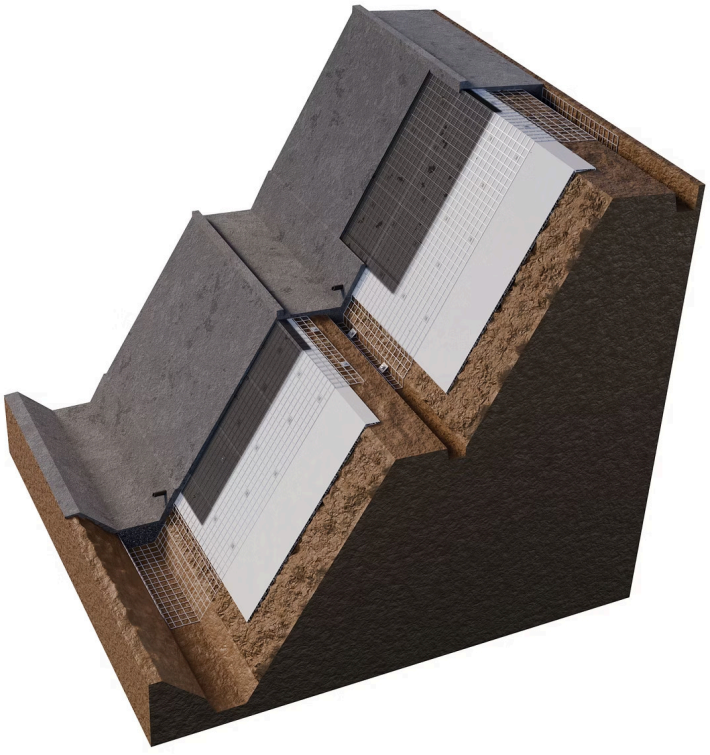
CONSTRUCK SLOPEPLUS

INSPECTION & MAINTENANCE MANUAL



The World's First SPaaP® for Non-Vegetative Mountain Cut Slopes

PROJECT DETAILS

- Project Name: _____
- Location: _____
- Client / Owner: _____
- Contract No.: _____
- Slope ID(s): _____
- Issue Date: _____
- Revision: _____

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1. GENERAL

1.1 Purpose

This manual defines the inspection, maintenance and minor repair procedures for slopes protected with ConstruckSlope Plus, a SPaaP (Slope Protection as a Product) system developed by Construck Systems & Technology and manufactured in Germany. The objective is to:

- Preserve the long-term stability and durability of ConstruckSlope Plus slopes.
- Maintain drainage and hydraulic performance as designed.
- Detect and address defects early, before they develop into safety or serviceability issues.
- Provide a standardised, repeatable procedure for inspections and maintenance that is compatible with the ConstruckSlope Plus method statement and technical data sheets.

1.2 Scope

This manual applies to all slopes where ConstruckSlope Plus has been installed in accordance with:

- The approved Method Statement for ConstruckSlope Plus for the project; and
- The approved construction drawings and specifications.

It covers:

- Visual and detailed inspections;
- Routine maintenance;
- Minor and moderate repairs that do not change the design intent.

It does not cover:

- Redesign of the slope or global stabilisation works;
- Major structural modifications;
- Any works outside the original design scope.

Such activities must be designed and approved by the original designer / Construck / appointed geotechnical engineer.

1.3 References & Precedence

This manual shall be read in conjunction with, and is subordinate to:

1. Project-specific documents (highest precedence)

- Approved Method Statement for ConstruckSlope Plus.
- Issued-for-construction (IFC) and as-built drawings.
- Project specifications and contract documents.

2. Product documents

- ConstruckSlope Plus Technical Data Sheets (TDS).
- ConstruckSlope Plus and related ConstruckAnchor / ConstruckDrain product literature.

3. Applicable standards and guidelines

- Relevant national standards and, where applicable, Oman Highway Design Standards 2017 – Section on Slope Stabilisation, as design baseline.

In case of any conflict, the following order of precedence shall apply:

1. Contract / project specifications and drawings
2. Approved Method Statement for ConstruckSlope Plus
3. This Inspection & Maintenance Manual

2. SYSTEM DESCRIPTION – CONSTRUCKSLOPE PLUS

ConstruckSlope Plus is a shotcrete replacement SPaaP system for permanent slope protection and stabilisation. It is a factory-controlled, pre-engineered solution, installed as per the Construck method statement. Key elements (as per the specific project design) include:

01

Prepared Substrate / Slope

- Trimmed soil or rock slope formed to the design profile.
- Removal of loose material, unstable blocks, vegetation and debris.
- Local benching, berms and platforms where specified.

02

Drainage System

- Crest drains, interceptor drains and berm drains for surface water control.
- Toe drains where required.
- Sub-surface drainage components (e.g. ConstruckDrain geocomposite, sub-horizontal drains) where specified.
- Weepholes / relief drains through the facing at specified spacing and pattern.

03

Filter / Separation Layers

Nonwoven geotextile and/or drainage geocomposites serving as filter, separation and drainage layers behind the facing, preventing fines migration and managing seepage.

04

Reinforcement & Anchoring System

- Soil nails, rock bolts or ground anchors (e.g. ConstruckAnchor range) installed to the design length, diameter, inclination and spacing.
- Front reinforcement mesh / geogrid / welded bar system tied to anchors, providing reinforcement to the facing as per the method statement.

05

ConstruckSlope Plus Facing Layer

- Factory-controlled, pre-bagged cementitious or composite material forming the visible facing.
- Applied to a specified nominal thickness (project-specific) and finished as per method statement, including joints and detailing.
- Designed as a durable, low-permeability protective skin that replaces conventional shotcrete.

06

Terminations & Interfaces

- Top anchor trench and/or capping beam;
- Side and toe terminations integrated into adjacent structures, berms or ground;
- Specific interface details at culverts, walls, crash barriers and other structures.

07

Optional Vegetation / Green Variant (where specified)

In some designs, the ConstruckSlope Plus system may be combined with vegetated facings (SPaaP "Green" variants) using compatible surface treatments and planting schemes.

All maintenance activities described in this manual shall respect the original system configuration and shall not block drainage paths or compromise anchors and reinforcement.

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3. ROLES & RESPONSIBILITIES

3.1 Owner / Client

- Ensure that inspections and maintenance are carried out as per this manual and contract requirements.
- Provide access for inspection and repair teams.
- Maintain a central record of all inspections, defects and repairs.
- Engage the designer or Construck when structural/geotechnical issues are suspected.

3.2 Maintenance Contractor

- Perform inspections and routine maintenance in accordance with this manual.
- Use only approved and compatible materials for repairs (as per ConstruckSlope Plus TDS and method statement).
- Avoid any work that would alter the design intent or damage anchors, reinforcement or drainage elements.
- Immediately report any significant cracking, deformation, seepage or movement.

3.3 Designer / Construck / Specialist Engineer

- Provide guidance and approval for any non-standard or structural repairs.
- Review inspection findings indicating potential instability or systemic issues.
- Update maintenance strategy if design assumptions change (e.g. due to adjacent construction, extended service life, or changed loading).

4. INSPECTION & MONITORING REGIME

4.1 Types of Inspection

a) Routine Visual Inspection (RVI)

Quick visual check from safe access (ground, berms, road shoulders, or rope / MEWP as required). Focus on obvious defects, drainage, vegetation and safety issues.

b) Detailed Inspection (DI)

Close-up systematic inspection of the entire slope or defined segments, including facing, anchors, weepholes, terminations and interfaces, with measurements and detailed records.

c) Special Inspection (SI)

Targeted inspection following unusual or extreme events, such as:

- Intense or prolonged rainfall
- Flooding or overtopping
- Earthquakes
- Impact from vehicles or falling rock
- Adjacent excavation or construction that may affect slope stability

4.2 Recommended Inspection Frequency

Unless otherwise specified in the contract or by the designer:

Year 1–2 after Completion

- **Routine Visual Inspection (RVI):** twice per year (e.g. post-wet season & post-dry season).
- **Detailed Inspection (DI):** once per year.

After Year 2

- **Routine Visual Inspection (RVI):** once per year.
- **Detailed Inspection (DI):** every 2–3 years, or as required by Owner/Engineer.

Special Inspection (SI)

After any extreme event or observed unusual behaviour, as soon as safe access is available.

The Owner may increase frequency for critical slopes, high-risk locations or where previous defects have been identified.

5. INSPECTION CHECKLISTS

All inspections should use an inspection form (see Annex A) and be supported by dated photographs and sketches indicating locations of observations.

5.1 Facing Layer (ConstruckSlope Plus Surface)

Check for:

- **Cracking**
  - Hairline / map cracking (non-structural).
  - Wider cracks (> approx. 0.3–0.5 mm) especially at joints, around anchor heads, and at geometric discontinuities.
  - Cracks that appear new, widening or associated with seepage.
- **Spalling & Delamination**
  - Local loss of cover, flaking, hollow areas or debonding.
  - Impact damage (from falling rocks, vehicles, etc.).
- **Surface Condition**
  - Scaling, erosion or abrasion.
  - Unusual staining or leaching that may indicate water or chemical attack.
  - Exposure of reinforcement mesh or underlying substrate.

Record location, extent and severity for each defect.

5.2 Anchors, Soil Nails, Rock Bolts & Plates

Check all visible anchor heads and hardware:

- **Condition of plates, washers, nuts and caps:**
  - Any missing hardware.
  - Light surface rust vs. severe corrosion with section loss.
  - Deformation, bending, or signs of pull-out.

- **Condition of surrounding facing:**
  - Cracking or crushing around anchor heads.
  - Loss of embedment or local debonding.

Any suspect loss of anchorage or severe corrosion shall be reported for engineering review.

5.3 Drainage System

Verify that drainage is functioning as designed:

- **Surface Drainage**
  - Crest, berm and toe drains free of debris, silt, vegetation and rubbish.
  - No standing water in channels except as designed.
  - No erosion, undermining or damage to channel linings.
- **Weepholes / Relief Drains**
  - Each outlet visible and not blocked.
  - Flow, where present, is controlled and not under high pressure (no strong jetting or erosion at outlet).
  - No clogging by roots, sediment or biological growth.
- **Unexpected Seepage**
  - Seepage zones on the facing not corresponding to the designed drainage pattern.
  - Persistent wet patches, mineral deposits or algae growth indicating chronic moisture.

5.4 Global Slope Behaviour

Assess the overall stability and geometry:

- **At Crest**
  - New tension cracks or widening of existing cracks parallel to slope crest.
  - Settlement, depressions or loss of edge support.
- **Facing Profile**
  - Bulging or sagging relative to original profile.
  - Localised displacement of facing panels (if present).
- **At Toe**
  - Heave, uplift or bulging.
  - Accumulation of slide debris or significant erosion.
- **Interfaces with Structures**
  - Gaps or steps at joints between ConstruckSlope Plus and walls, culverts, foundations or barriers.
  - Relative movement or misalignment.

> **Any sign of global deformation must trigger further geotechnical assessment.**

5.5 Vegetation & Environmental Conditions

- **Vegetation in line with design intent** (bare, partially vegetated, or green variant):
  - No large trees or aggressive shrubs with roots penetrating the facing near joints or anchors unless specifically designed.
  - No root-induced cracking or lifting.

- **Environmental exposures:**
  - No chemical spills or industrial discharge onto the slope.
  - No uncontrolled discharges from pipes or drains onto the facing.

6. ROUTINE MAINTENANCE ACTIVITIES

6.1 Cleaning & Housekeeping

- Regularly remove loose debris, litter, rocks and sediment from:
  - Crest drains and berm drains;
  - Toe drains;
  - Weephole outlets and outlet channels.
- Keep access paths, inspection routes and safety guardrails clear and functional.

6.2 Drainage Maintenance

- Clear blockages in surface channels with hand tools; avoid damaging the lining.
- If flushing of pipes is necessary, use low-pressure methods compatible with the system.
- Maintain erosion protection at outlets (rip-rap, concrete aprons, etc.) in good condition.

Do not:

- Cut new openings in the ConstruckSlope Plus facing for drainage without designer approval.
- Block or seal existing weepholes, unless part of a specific remedial design.

6.3 Minor Crack & Surface Defect Repairs

For non-structural cracks and minor surface defects:

1. Confirm the crack is not a designated movement joint or expected crack location per drawings.
2. Clean the area: remove loose material, dust, dirt and any weak edges.
3. Apply approved, compatible repair material (as per ConstruckSlope Plus TDS / repair guidance) – typically a fine repair mortar or flexible sealant appropriate for the system.
4. Finish to match surrounding texture and avoid creating water traps.
5. Record the repair in the maintenance log (Annex B).

7. NON-ROUTINE REPAIRS

Any work beyond minor patching should be reviewed and approved by the designer / Construck before implementation.

7.1 Local Spalls & Delamination

- Mark the boundaries of the defective area.
- Carefully remove loose and unsound material back to sound ConstruckSlope Plus facing.
- Take care not to damage underlying reinforcement mesh, anchors or drainage components.
- Prepare the substrate as per method statement (clean, roughened if required, saturated surface-dry where specified).
- Rebuild the facing using Construck-approved repair mortar or ConstruckSlope Plus material, reinstating the original nominal thickness.
- Cure in accordance with product data sheet.

7.2 Voids / Loss of Support Behind Facing

If hollow areas or voids are suspected behind the facing:

- Investigate extent (percussion sounding, limited test openings if approved).
- Verify that drainage paths (sub-horizontal drains, weepholes) will not be blocked by grouting.
- Design and inject suitable low-shrink grout to fill voids, under designer guidance.
- Monitor for new voids or differential movement.

7.3 Anchor and Hardware Issues

- Replace missing or severely corroded nuts, washers or plates with items of equivalent or higher strength and corrosion protection.
- Do not cut, weld or heat-treat anchor bars or plates.
- Where severe corrosion or suspected loss of capacity is identified, the designer may require:
  - Installation of supplementary anchors; or
  - Local strengthening of the facing system.

7.4 Significant Cracking / Movement and Geotechnical Concerns

Treat the following as indicators of potential structural or geotechnical distress:

- Cracks > approx. 1.0 mm with visible offset or continuous length;
- Cracks associated with seepage, displacement or bulging;
- New crest tension cracks or toe heave;
- Progressive widening of cracks between inspections.

Actions:

- Immediately record location, width and length;
- Photograph and, if possible, install simple monitoring marks or crack gauges;
- Notify Owner and designer;
- Implement any temporary risk-reduction measures recommended by the engineer (e.g. fencing off area, temporary drainage).

8. ACCESS, SAFETY & ENVIRONMENTAL PROTECTION

- All inspections and maintenance works shall comply with applicable health and safety regulations and project HSE plan.
- Use appropriate access methods: safe slopes, MEWP, scaffold, or rope-access, as per risk assessment.
- Where the slope is adjacent to a road or railway, implement traffic and operational safety measures as required.
- Prevent spillage of cementitious materials, grout or chemicals into natural watercourses.
- Collect and dispose of waste (debris, removed materials, packaging) in accordance with environmental regulations and project requirements.

9. DOCUMENTATION & RECORDS

The following records shall be maintained by the Owner (or their representative) for the entire service life of the slope:

- As-built drawings and final approved Method Statement for ConstruckSlope Plus;
- Material certificates and QA/ITP documentation from construction;
- All inspection reports (RVI, DI, SI) with photos and sketches;
- Maintenance & repair logs (Annex B), including materials used and dates;
- Any engineering assessments or geotechnical reports prepared following defects or events.

These records provide essential context for future assessments and should be kept centrally, backed up and accessible.

10. STANDARD FORMS (TEMPLATES)

Annex A – Routine / Detailed Inspection Checklist (Template)

Project: _____ **Slope ID / Chainage:** _____
Inspection Type: RVI / DI / SI **Date:** _____
Weather (recent / current): _____ **Inspector(s):** _____

1. Facing Layer (ConstruckSlope Plus)

- ☐ No visible defects
- ☐ Hairline cracks (record locations)
- ☐ Cracks > 0.3–0.5 mm (record width & length)
- ☐ Spalling / delamination
- ☐ Exposure of reinforcement / substrate
- **Remarks:** _____

2. Anchors, Soil Nails, Rock Bolts & Plates

- ☐ All plates, nuts, washers present
- ☐ Light surface corrosion only
- ☐ Severe corrosion / section loss
- ☐ Deformation or signs of pull-out
- ☐ Cracking around anchor heads
- **Remarks:** _____

3. Drainage System

Surface drains:

- ☐ Clean and free-flowing
- ☐ Partially blocked
- ☐ Damaged / eroded lining

Weepholes:

- ☐ All visible and free
- ☐ Some blocked / clogged
- ☐ Seepage under high pressure
- ☐ Erosion at outlet

Unexpected seepage or wet patches:

- ☐ None
- ☐ Observed (location): _____
- **Remarks:** _____

4. Global Slope Behaviour

Crest:

- ☐ No new cracks
- ☐ New / widened cracks (describe)

Facing profile:

- ☐ No bulging or displacement
- ☐ Local bulging / sagging (location)

Toe:

- ☐ Stable
- ☐ Heave / uplift / erosion

Interfaces with structures:

- ☐ No gaps / movement
- ☐ Gaps / misalignment (location)
- **Remarks:** _____

5. Vegetation & Environment

Vegetation:

- ☐ As per design
- ☐ Excessive growth blocking drains
- ☐ Trees / shrubs impacting facing

Contamination / spills:

- ☐ None
- ☐ Observed (describe)
- **Remarks:** _____

6. Actions & Recommendations

- **Immediate maintenance required:** ☐ Yes ☐ No
  If yes, describe: _____
- **Engineering / geotechnical review recommended:** ☐ Yes ☐ No
- **Next inspection due:** _____

Inspector Signature: _____
Owner / Representative (if present): _____

Annex B – Maintenance & Repair Log (Template)

Project: _____ **Slope ID / Chainage:** _____

Date	Description of Defect / Area	Repair / Maintenance Performed	Materials Used (incl. product names)	Responsible Party	Remarks