H2O Field Services · User manual

Punch list (GQE)

Quality Assurance in Execution and the client punch list: record the field deviation with a photo, fix it, request validation with the closing photo, validate by Quality, open the work order, escalate to NCR, the items opened by a commissioning failure, and the handover report as PDF and spreadsheet

Version 2.1 · 11/5/2026

Screens captured in the demo company "_Demo Company (EN)", with fictitious data: the project "Vila Nova Residential — Tower 1" and, in commissioning, the project "Data Center — Cooling Retrofit".

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1. Punch list (GQE): concepts

The **Punch list (GQE)** module — GQE stands for Quality Assurance in Execution — records, per project, the deviations found on site: a loose conduit, rebar without cover, scaffolding without a guardrail, paint below standard. The goal is to **fix them before the formal inspection** and **prove the fix with a photo** at project handover. It is also the client's *punch list*: what the client points out at the inspection goes in here, with the same routine.

Each item gets a number within the project (**GQE #1**, **#2**…), goes through **Triage / Under review**, **In progress** and **Under validation**, and only ends when **Quality** checks the closing photo and completes it. Every step is kept in the **History** — who did it, when and with what comment — and that history goes into the handover report.

> **Tip.** The punch list item is the quick day-to-day record of the job. It does not replace the **NCR** (Non-Conformity Report): when the deviation is a formal non-conformity, the item itself is **escalated to NCR** with a button (chapter 7).

1.1 The concepts

Concept	What it means
Item	a field deviation recorded on a project, with the project's own number (**GQE #n**). The number is never reused, not even after an item is deleted.
Project	an H2O project (manual Projects). The item and its photos belong to the **site** of the project: only people who see that site can see the item and work on it.
Type	**GQE (internal)** — found by the team itself; **Client punch list** — pointed out by the client or the inspector at the inspection.
Priority	**Critical**, **High**, **Medium** or **Low**.
Discipline and **Origin**	the technical area (Civil, Elétrica, Mecânica…) and where the deviation came from (Engenharia / Projeto, Execução / Mão de obra, Materiais / Fornecedores…). They are company lists, editable, and the names appear as they were registered — the factory names are in Portuguese (chapter 10).
Responsible and **Due date**	who fixes it and by when. Once the date passes without a fix, the item is **overdue** (in red).
Opening photo	the evidence of the problem when it is recorded.
Closing photo	the evidence of the fix. **Required** to request validation.
Validation	the check by Quality — whoever has **Validate (Quality)** in the profile. Only Quality completes, rejects, closes without a fix and reopens — and whoever requested the validation does not approve it.

1.2 Where items come from

How it is created	Who records it	Chapter
New item	anyone with **Create** in Punch list (GQE): engineering, quality, safety, the client's inspector	4
failure of a **commissioning** test	H2O, by itself, when the test task is completed as **Failed**	8

Apart from a commissioning failure, nothing is automatic: the work order and the NCR are only created when someone clicks the button (chapter 7).

1.3 Who does what

Role	What they do
whoever points it out (engineering, quality, client/inspection)	records the deviation with a photo, priority, responsible and due date
responsible (foreman, technician, supplier)	starts fixing, attaches the closing photo and requests validation
Quality	checks the evidence and completes — or rejects with a comment; decides **Won't fix**; reopens
project management	follows the indicators per project, follows up with the **Pending** PDF and hands over the **Complete** PDF with the acceptance

1.4 Where to find it

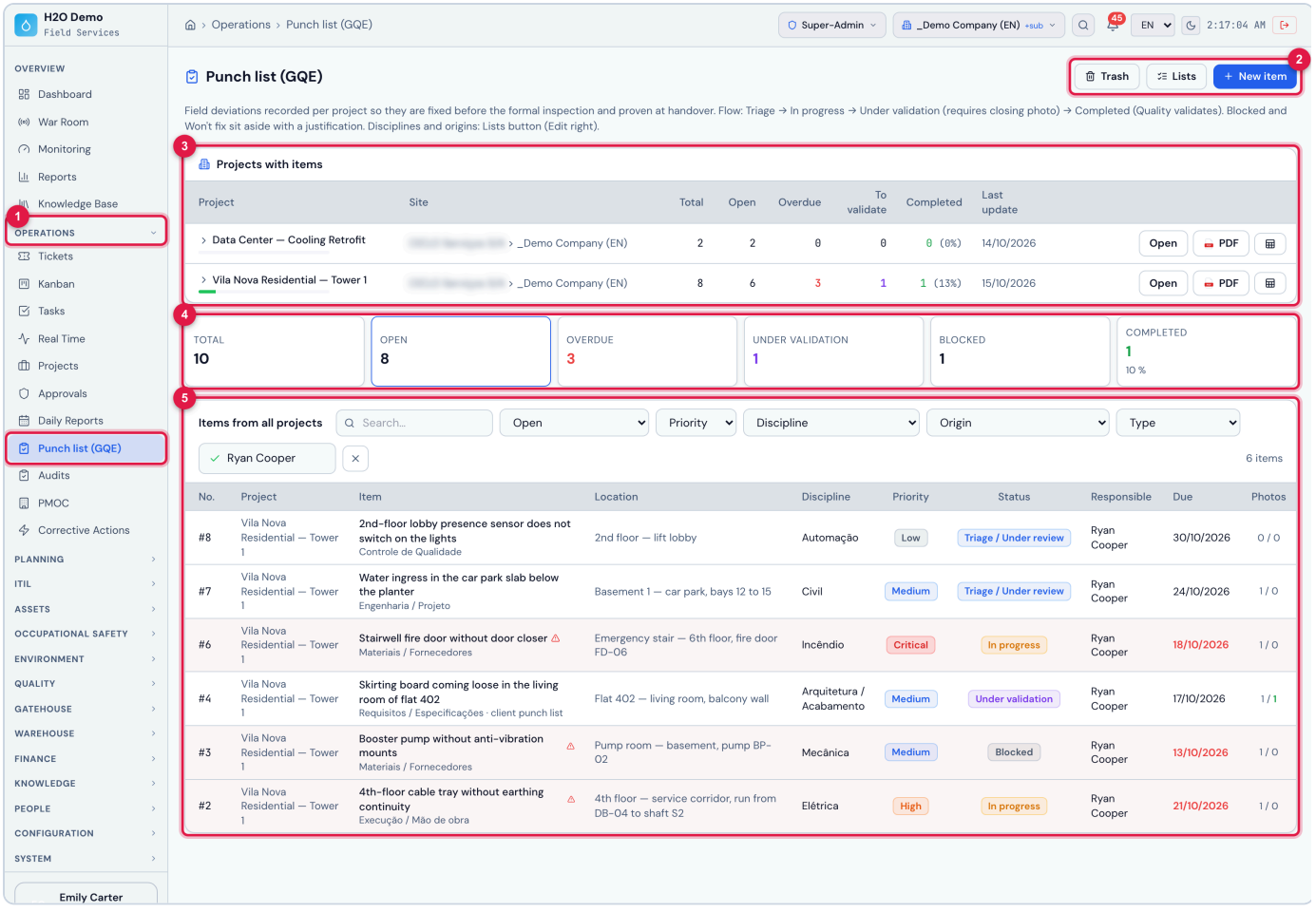


Figure 1. Operations › Punch list (GQE): the projects with items, the indicators and the list of open items of all projects — here filtered by the responsible Ryan Cooper.

1. The **Operations › Punch list (GQE)** menu.
2. **Trash**, **Lists** (disciplines and origins) and **New item**.
3. The **Projects with items** table.
4. The indicators — clickable.
5. The **Items from all projects** list, with the filters (here, **Responsible…** = Ryan Cooper).

Where	What you do there	Chapter
Operations › **Punch list (GQE)**	projects, indicators, filters, list, PDF and spreadsheet	3 and 9
New item	record	4
item page (click a row)	data, photos, flow, work order, NCR and history	5, 6 and 7
Lists	disciplines and origins	10
Trash	the deleted items: restore or delete permanently	5
People › **Profiles** › profile › **Permissions**, group **Operations**	the rights	2

System rule. Punch list items are handled on the **web**. The app has no punch list screen: in the app, what creates an item is the failure of a commissioning test, which the server turns into a GQE item when the completion arrives (chapter 8). The **work order** opened from an item, on the other hand, reaches the technician's app like any ticket (chapter 7).

Tip. H2O notifies in the bell and by e-mail, in the recipient's language: the **responsible**, when assigned, when the work order is opened, when the validation is rejected and when the item is completed; the site's **Quality**, when an item arrives for validation. Whoever performed the action does not receive their own notice (chapter 6).

2. Access rights

Punch list items use the **Punch list (GQE)** row of the profile (**People** › **Profiles** › profile › **Permissions** tab, group **Operations**). Besides the usual boxes, the row has the extra box **Validate (Quality)**.

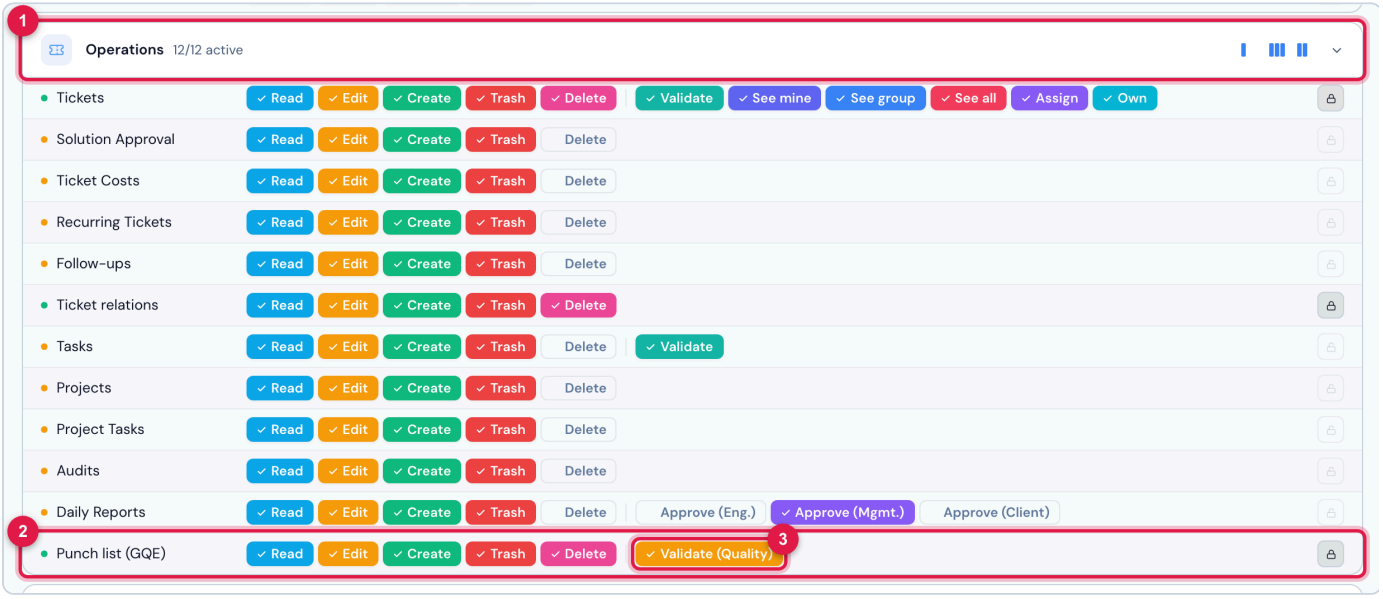


Figure 2. People › Profiles › **Super-Admin** › **Permissions**: the **Punch list (GQE)** row, in the **Operations** group, with the **Validate (Quality)** box.

1. The **Operations** group.
2. The **Punch list (GQE)** row — **Read**, **Edit**, **Create**, **Trash** and **Delete**.
3. The extra box **Validate (Quality)**.

To…	You need, in the Punch list (GQE) row
see the menu, the projects, the list, the item pages, the **PDF** and the **Spreadsheet**	**Read**
New item	**Create**
Edit, **Start fixing**, **Request validation**, **Block**, **Attach** photos — on any item	**Edit**
Open work order and the **Lists** page (disciplines and origins)	**Edit**
Validate and complete, **Reject**, **Won't fix** and **Reopen**	**Validate (Quality)**
Escalate to NCR	**Edit** here **and Create** in the **NCR (Non-conformity)** row
move an item to the trash (trash icon in the header of the item page), open the **Trash** and **Restore**	**Trash**
Delete permanently an item that is in the trash	**Delete**
delete a photo or an attachment added by mistake (trash icon on the photo)	**Trash**, while the item is still open

> **System rule.** The **responsible** for the item, even without **Edit**, handles their own items: **Edit**, **Start fixing**, **Block**, **Attach** photos and **Request validation**. They only need **Read** — attaching from the item page needs no right on documents. **Open work order**, **Escalate to NCR** and deleting a photo still need the rights in the table.

System rule. The rights only apply to the sites you can see. An item of a project on another site does not appear in the list and cannot be edited, change status, receive photos, be deleted, or open a work order or NCR — for H2O, it does not exist for you (**Punch item not found**).

Warning. Validate (Quality) does not apply to the validation the person requested: whoever took the item to **Under validation** neither validates nor rejects it — another person with **Validate (Quality)** decides (chapter 6).

2.1 The profile defaults

When the module was installed, each profile received punch list rights based on what it already had in **Deviations** (Occupational Safety) — whoever handles field deviations handles punch list items:

The profile had in Deviations	It received in Punch list (GQE)
Trash (management profiles)	**Read**, **Edit**, **Create**, **Trash** and **Validate (Quality)**
Create (technicians)	**Read**, **Edit** and **Create** — they record and fix, they do not validate
only **Read** (client, requester, self-service)	nothing — the menu does not show; grant it by hand if the client should see or record items

Tip. For the client or the inspector to record the *punch list* directly in H2O, give their profile **Read** and **Create**. Without **Edit**, they cannot change other people's items.

3. The punch list screen

The screen has three parts, from top to bottom: the **Projects with items** table, the indicators and the item list. With no project chosen, everything adds up the projects you can see; with a project chosen, everything is about that project only.

3.1 Projects with items

One row per project that already has at least one item, on the sites you can see. A project with no item does not appear: the first one is recorded with **New item** (chapter 4).

Column	What it counts
Project	the name (click to choose the project; click again to go back to all) and the green bar of the % completed
Site	the site of the project
Total	all items of the project
Open	**Triage / Under review**, **In progress**, **Under validation** and **Blocked**
Overdue	with the **Due date** passed and still in **Triage / Under review**, **In progress** or **Blocked** (in red)
To validate	**Under validation** — waiting for Quality
Completed	the validated ones, with the % of the total
Last update	the date of the last change to an item of the project

At the end of each row: **Open** (chooses the project), **PDF** (opens the report options) and the **Spreadsheet** icon (downloads the CSV). The PDF and the spreadsheet of the row take the list filters (chapter 9).

3.2 The indicators and the list

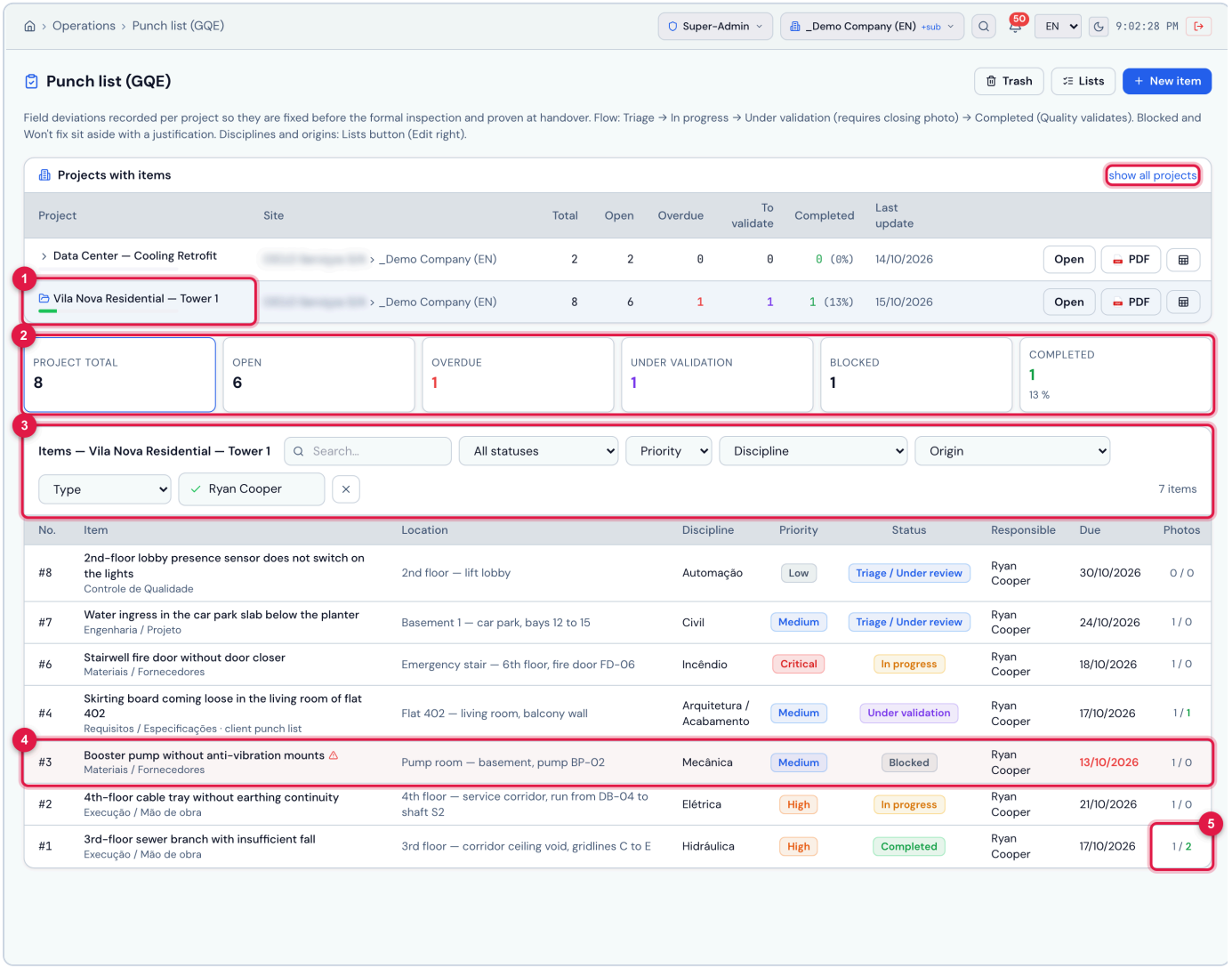


Figure 3. The project **Vila Nova Residential — Tower 1** chosen, with the **Project total** card selected: the indicators and the list are now about that project only. The list is filtered by **Responsible…** = Ryan Cooper — the cards do not change with the list filters.

1. The chosen project and **show all projects**, which goes back to the overview.
2. The cards **Project total**, **Open**, **Overdue**, **Under validation**, **Blocked** and **Completed** — the selected card is the list filter.
3. The filters: **Search…**, status, **Priority**, **Discipline**, **Origin**, **Type** and **Responsible…**, and the total (**N items**).
4. An **overdue** item: row in red, ⚠ and the **Due** date in red.
5. The **Photos** column: opening / closing; the closing count turns green once the evidence of the fix has been attached.

- The list opens showing only the **Open** items. To see everything, click the **Total** card (or **Project total**) or choose **All statuses** in the filter.
- The cards filter the list: **Open**, **Overdue**, **Under validation**, **Blocked**, **Completed**. **Overdue** only exists as a card.
- **Search…** looks in the title, the location, the description and the project name. **Responsible…** shows only one person's items: type part of the name and pick it.
- The list brings all items of the filter, with no limit. With no project chosen, it gets the **Project** column; the order is by project and, within it, from the newest number to the oldest.

- Below the title, each item shows the **Origin** and, when it comes from the client, **client punch list**. Dates follow the company date format.
- Click any row to open the item page (chapter 5).

> **System rule.** An item **Under validation** does not count as overdue: the fix has been done and is waiting for Quality. It appears in the **Under validation** card and in the **To validate** column.

4. Recording an item

Click **New item** (needs **Create**). If a project was chosen on the screen, it comes already filled in.

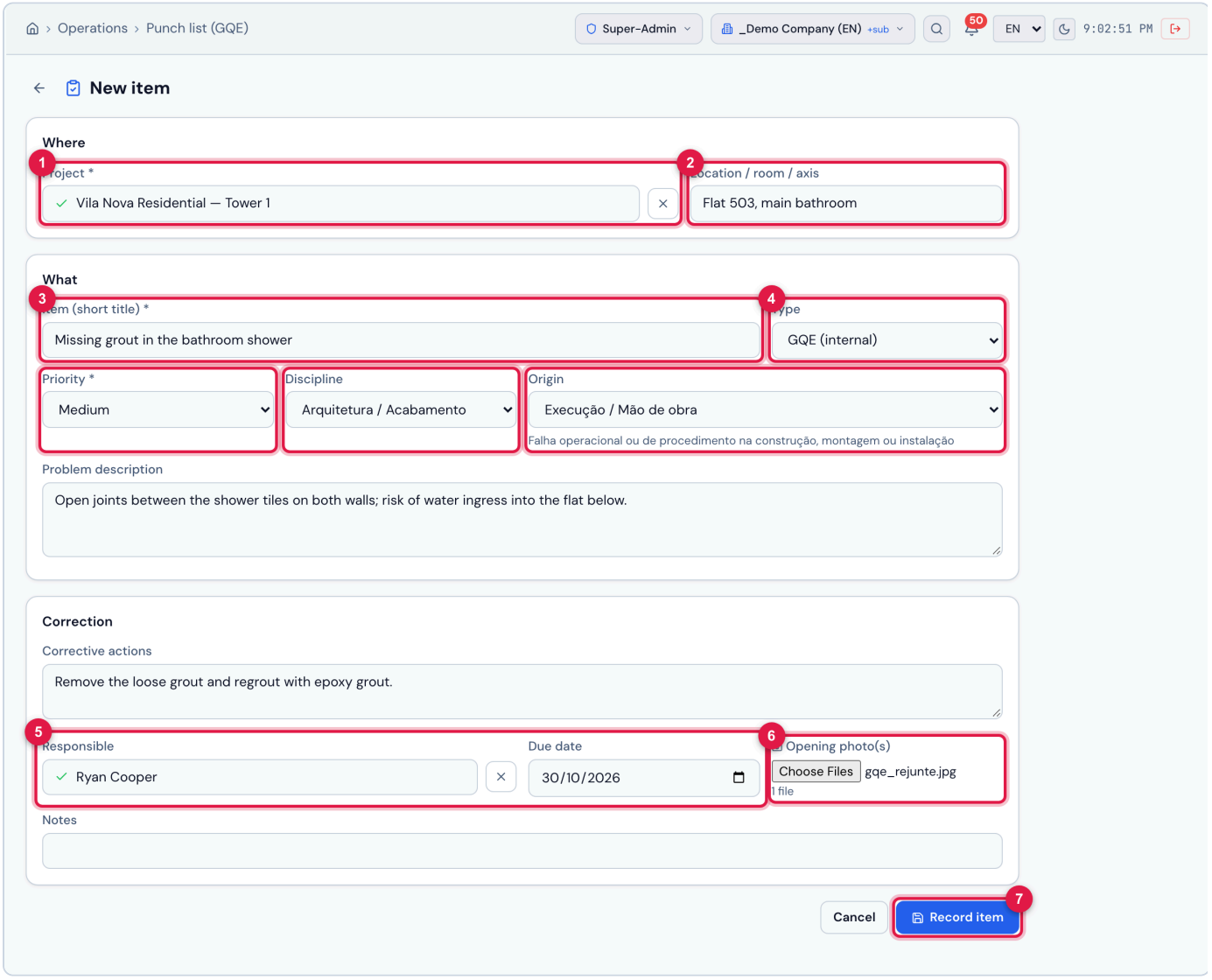


Figure 4. The **New item** page, in three blocks: **Where**, **What** and **Correction**.

1. **Project** (required) — the list brings all projects of the sites you can see; type to filter.
2. **Location / room / axis** — where the deviation is.
3. **Item (short title)** (required) — it shows in the list, in the PDF and in the work order title.
4. **Type**, **Priority**, **Discipline** and **Origin** — when you choose the origin, its description appears below.
5. **Responsible** and **Due date**.
6. **Opening photo(s)** — several at once.
7. **Record item**.

1. In **Where**, choose the **Project** and fill in the **Location / room / axis** (e.g. "Plant room, floor 3, axis B-4").
2. In **What**, write the title, choose the **Type** (**GQE (internal)** or **Client punch list**), the **Priority**, the **Discipline** and the **Origin**, and describe the problem: what was found, where and why it is a deviation — cite the design or the standard, when there is one.
3. In **Correction**, write the **Corrective actions**, choose the **Responsible** and the **Due date**, and attach the **Opening photo(s)**.
4. Click **Record item**. The item is created in **Triage / Under review**, with the next number of the project, and its page opens.

Field	Rule
Project, **Item (short title)**	required. Only projects of the sites you can see; the item belongs to the site of the project.
Priority	comes as **Medium**; change it if needed.
Type	comes as **GQE (internal)**.
Discipline, **Origin**	only the active options of the **Lists** page (chapter 10).
Responsible	the active users of the sites you can see — all of them; type part of the name to filter.
Opening photo(s)	images only; they belong to the site of the item. If any fails to upload, the message says how many (**N photos failed**) — attach them again on the item page.

Tip. Only the project and the title are required. The rest can be completed later on the item page (**Edit**) — but responsible, due date and opening photo are what let you follow up and prove.

5. The item page

The item page gathers everything about the item, on a single page:

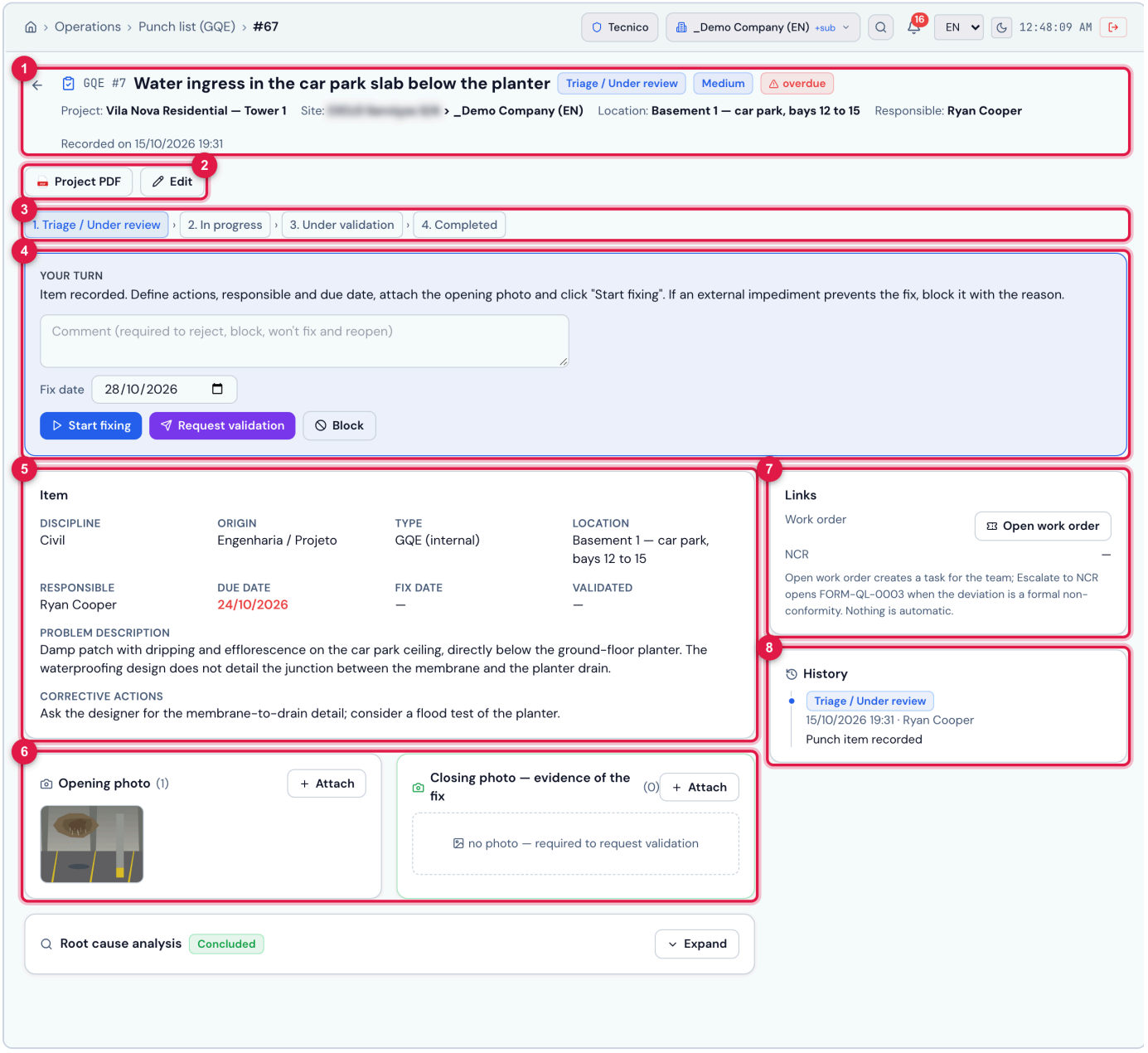


Figure 5. The page of **GQE #7** "Water ingress in the car park slab below the planter", in **Triage / Under review**, seen by the responsible, Ryan Cooper.

1. The header: **GQE #n**, the title, the status, the priority and, when that is the case, **overdue** and **client punch list**; below, **Project**, **Site**, **Location**, **Responsible** and **Recorded on**.
2. **Project PDF** and **Edit** (and the trash icon, for those with **Trash**).
3. The step bar: **1. Triage / Under review › 2. In progress › 3. Under validation › 4. Completed**.
4. The **Your turn** (or **Current step**) box: what to do now, the comment and the buttons.
5. The item data.
6. **Opening photo** and **Closing photo — evidence of the fix**, side by side, with **Attach**.
7. **Links**: the work order and the NCR (chapter 7).
8. **History**: every status change, with date, person and comment.

The box at the top says **Your turn** when the next step is yours — and shows the buttons your profile allows. When the step belongs to someone else, it says **Current step** and explains who is being waited for (e.g.

"Waiting for Quality to validate the fix.").

5.1 The statuses and who acts

Status	What it means	Who acts	Button → new status	Right
Triage / Under review	recorded; assessing priority, responsible and due date	team or responsible	**Start fixing** → In progress · **Request validation** → Under validation · **Block** → Blocked	**Edit** or being the responsible
In progress	fix being carried out	team or responsible	**Request validation** → Under validation · **Block** → Blocked	**Edit** or being the responsible
Under validation	fixed; waiting for the check	Quality — another person, not the one who requested	**Validate and complete** → Completed · **Reject** → In progress	**Validate (Quality)**
Completed	fixed and validated; goes into the handover	Quality	**Reopen** → Triage / Under review	**Validate (Quality)**
Blocked	fix stopped by an external impediment	team or responsible	**Start fixing** → In progress · **Request validation** → Under validation	**Edit** or being the responsible
Won't fix	closed without a fix, by formal decision	Quality	**Reopen** → Triage / Under review	**Validate (Quality)**

System rule. Won't fix can be applied from any open status (Triage / Under review, In progress, Under validation, Blocked) and belongs to Quality only.

Button	Comment
Reject	required — the assessment: what is still missing
Block	required — the reason (material, third parties, clearance…)
Won't fix	required — the justification (management decision, accepted risk, false positive)
Reopen	required — the reason
Start fixing, **Request validation**, **Validate and complete**	optional — if written, it goes into the history

5.2 Edit

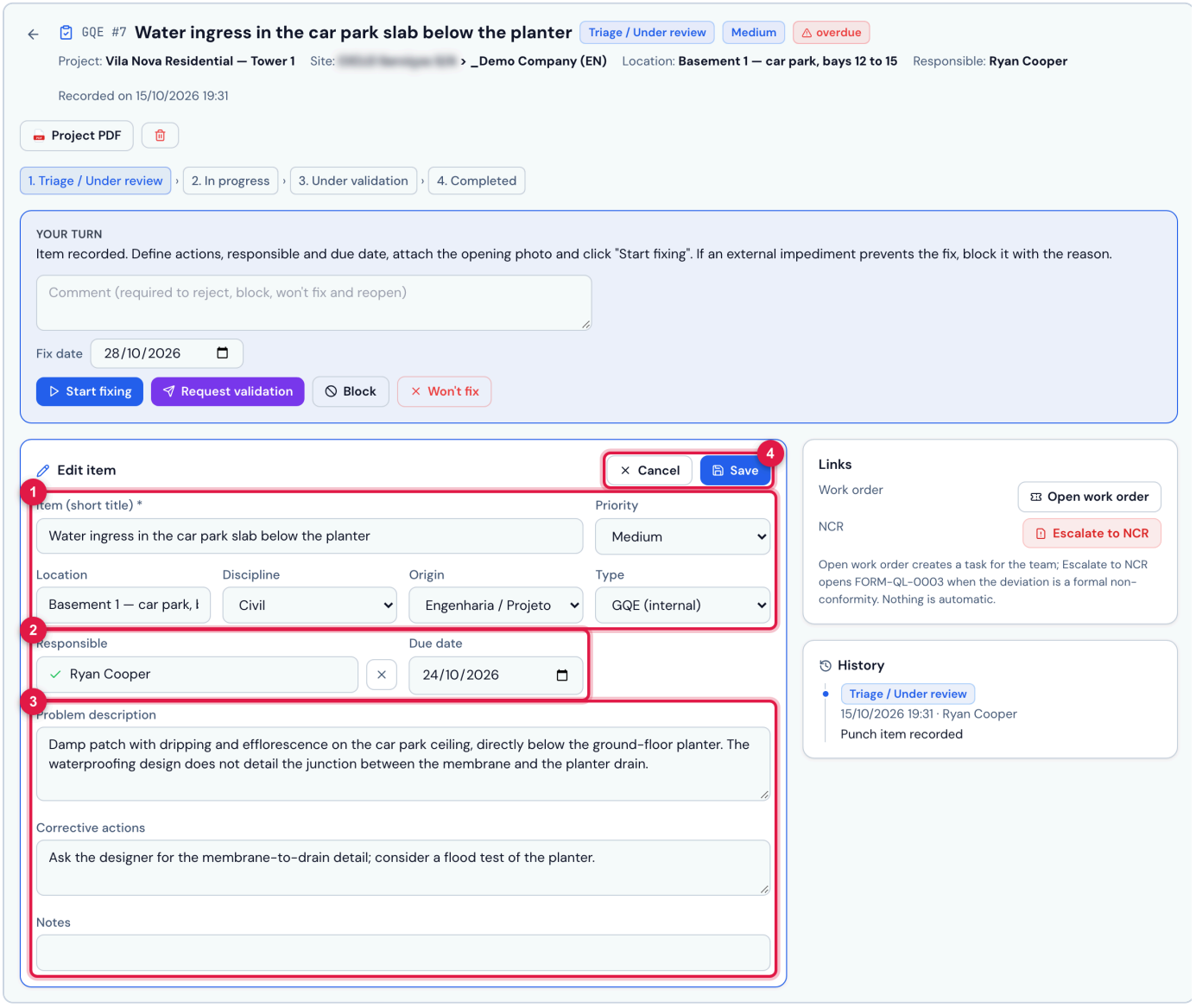


Figure 6. Edit opens the fields on the item page itself.

1. Title, **Priority**, **Location**, **Discipline**, **Origin** and **Type**.
2. **Responsible** and **Due date**.
3. **Problem description**, **Corrective actions** and **Notes**.
4. **Cancel** / **Save**.

- **Edit** shows for those with **Edit** and for the responsible, while the item is not **Completed** or **Won't fix**. To change a closed one, Quality reopens it first.
- The **Project** cannot be changed — nor the site, which comes from it: an item recorded on the wrong project is deleted and recorded again.
- Field changes go to the H2O audit log; the **History** of the item page shows only status changes (and the escalation to NCR), with date and time in the company format. The texts H2O itself writes in the history (**Punch item recorded**, **Opened automatically…**, **Escalated to NCR…**) appear in the reader's language.
- A discipline or origin that was deactivated still shows on the item that already uses it.

5.3 Photos and attachments

- **Attach** accepts images and PDF, several at once, in both panels — while the item is open, for those with **Edit** and for the responsible, with no right needed on documents. The files belong to the site of the item.
- The number in brackets is the number of files in the panel. Click a photo to open it at full size; a PDF shows by its name.
- In the report, images come out in pairs (opening × closing) and attached PDFs by file name (chapter 9).

> **System rule.** Photo or attachment added by mistake: whoever has **Trash**, with the item still open, sees a trash icon in the corner of each file. It asks **Delete "<name>" from this item?** and removes the file from the item — the deletion is logged. If the same file is also evidence of an escalated NCR, it stays in the NCR. Once **Completed** or **Won't fix**, no photo can be removed.

5.4 Delete and the trash

The trash icon in the header (**Trash** right) asks **Move this punch item to the trash? Anyone with the Trash right can restore it later.** The item leaves the list, the indicators, the PDF, the spreadsheet and the asset dossier, and H2O records who deleted it and when. Its number is not reused.

- The **Trash** button, at the top of the punch list screen (**Trash** right), shows the deleted items of the sites you can see — only those of the chosen project, if there is one —, with **No.**, **Project**, **Item**, **Status**, **Responsible**, **Deleted by** and **Deleted on**, and the search. **Back to punch items** returns to the list.
- **Restore** brings the item back to the list with the status it had, with photos, history and links.
- **Delete permanently** (**Delete** box of the profile) removes the item from the trash for good: before deleting, H2O keeps the item, its history and photos in the purged records archive. The work order opened from it remains, and the photos go to the document trash only if they are not linked to anything else.

> **System rule.** An item already escalated to NCR cannot be deleted: **A punch item with an NCR cannot be deleted.** (not even permanently: **A punch item with an NCR cannot be permanently deleted.**)

5.5 Root cause analysis

Below the photos, the **Root cause analysis** block records how the team reached the origin of the deviation — by **5 Whys**, **Ishikawa** or **FMEA** —, with the root cause, the cause category and the corrective and preventive actions. On an item born from a commissioning failure it is **required to complete**; on the others, optional. Chapter 11 explains the three methods, the project Pareto and the lists.

6. Fixing, validating and closing

The normal path has four steps: **Start fixing**, fix, attach the **closing photo** and **Request validation**; Quality checks and **completes**. The detours — **Reject**, **Block**, **Won't fix** and **Reopen** — are recorded with the reason.

6.1 Fixing and requesting validation

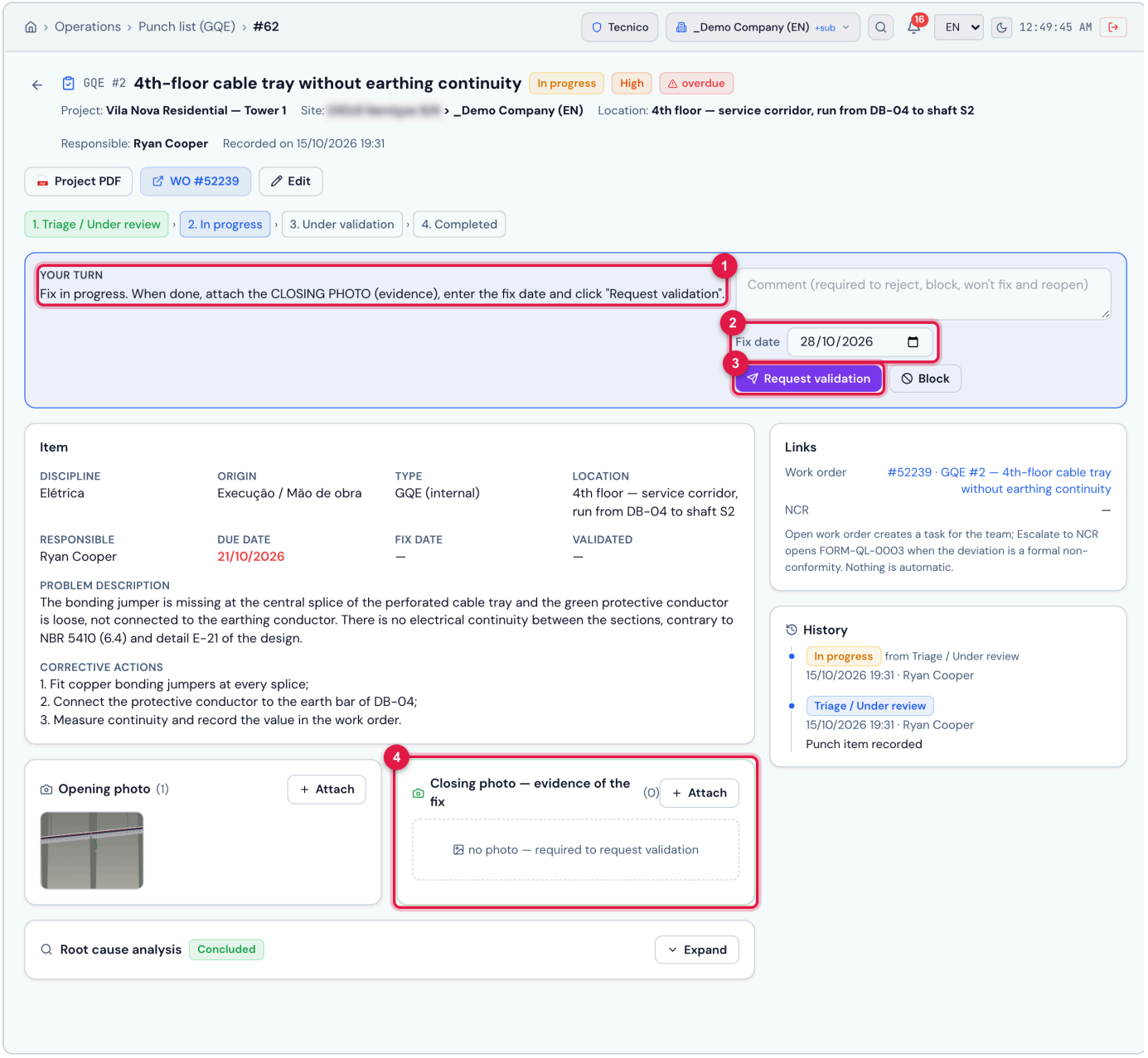


Figure 7. GQE #2 "4th-floor cable tray without earthing continuity", **In progress**, seen by the responsible: the closing photo is still missing to request validation.

1. The step text: attach the closing photo, enter the date and request validation.
2. **Fix date** — comes with today's date.
3. **Request validation**.
4. **Closing photo — evidence of the fix** — still **no photo**, with **Attach**.

1. On the item page in **Triage / Under review**, click **Start fixing**. The item goes to **In progress** (message **Fixing started**).
2. Carry out the fix.

3. In **Closing photo — evidence of the fix**, click **Attach** and upload the photo(s) of the finished work — preferably from the same angle as the opening photo.
4. Check the **Fix date**, write a comment if you wish, and click **Request validation**. The item goes to **Under validation** (message **Sent to Quality for validation**) and the decision passes to Quality.

> **System rule.** Without a closing photo, validation cannot be requested: **Attach the closing photo (evidence of the fix) before requesting validation.** Any file in the closing panel counts — photo or PDF —, but it is the photo that goes, paired with the opening one, into the handover report.

When the fix was already done before anyone opened the item, there is no need to go through **In progress**: **Request validation** also shows in **Triage / Under review** and in **Blocked**.

6.2 Validating or rejecting (Quality)

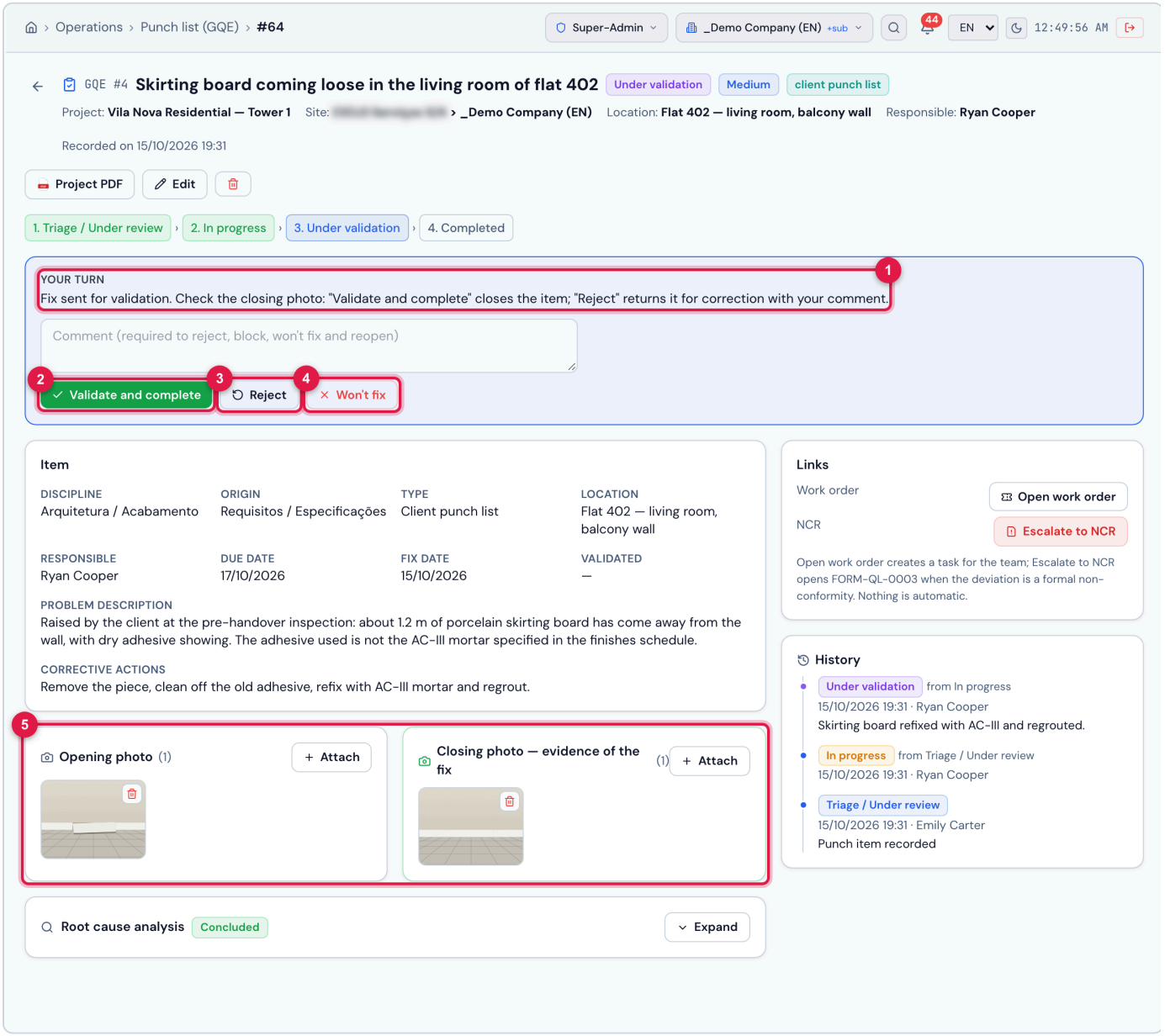


Figure 8. GQE #4 "Skirting board coming loose in the living room of flat 402" — **client punch list** — **Under validation**, seen by someone with **Validate (Quality)**.

1. The step text guides the check of the closing photo.
2. **Validate and complete**.
3. **Reject** — with the assessment in the comment.
4. **Won't fix**.
5. The opening and closing photos, to compare.

- **Validate and complete** closes the item as **Completed** and records who validated and when (**Validated** field).
- **Reject** sends it back to **In progress** with the assessment — what is still missing — in the history. The responsible fixes it, attaches a new photo and requests validation again.
- Whoever does not have **Validate (Quality)** sees **Current step** — "Waiting for Quality to validate the fix." — with no buttons.
- Quality is notified: the item appears in the bell of those with **Validate (Quality)** on the site, and the e-mail goes to them (see Notices in the bell and by e-mail, below).

System rule. Whoever requested the validation neither validates nor rejects it, even with **Validate (Quality)**: for that person both buttons disappear and the box says **You requested this validation. Another person with Validate (Quality) approves or rejects it — whoever fixes does not approve their own fix.** The latest request counts; an old item, with no request recorded in the history, is not blocked. **Won't fix** remains available.

6.3 Completed and Reopen

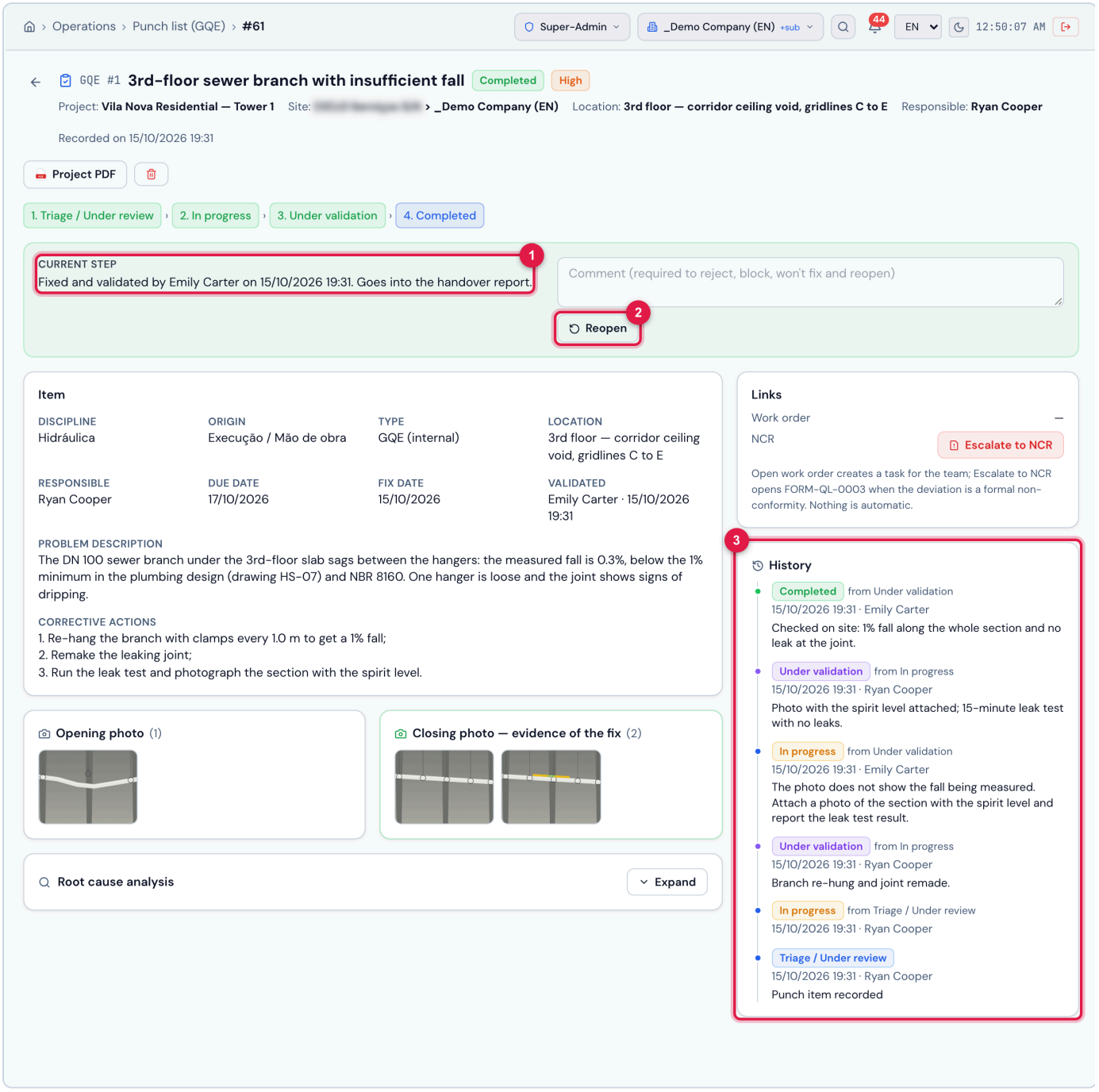


Figure 9. GQE #1 "3rd-floor sewer branch with insufficient fall", **Completed**: the green box with who validated and when, the opening photo and the two closing ones, and the history with one rejection.

1. **Fixed and validated by … on …** — with the date in the company format; goes into the handover report.
2. **Reopen** (Quality only) — with the reason.
3. The history, with all the back-and-forth (including a rejection).

A completed item cannot be edited or receive photos. If something needs to change, Quality clicks **Reopen** with the reason: it goes back to **Triage / Under review**, and the validation and the **Fix date** are cleared — the reopening stays in the history.

6.4 Blocking and resuming

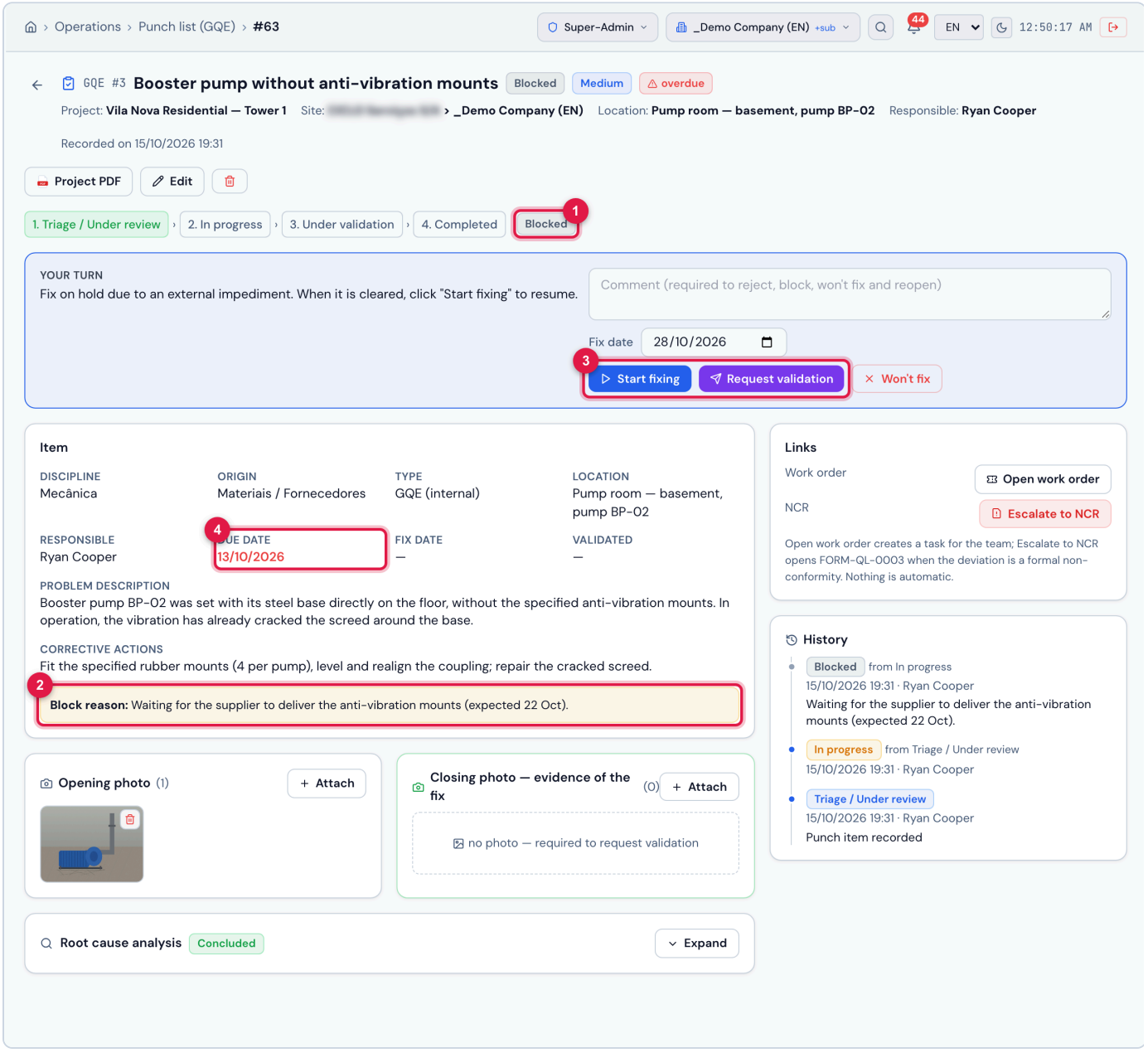


Figure 10. GQE #3 "Booster pump without anti-vibration mounts", **Blocked** waiting for the supplier: the reason highlighted and the due date passed, in red.

1. The **Blocked** badge next to the step bar.
2. **Block reason**.
3. **Start fixing** resumes the work; **Request validation**, if the fix has already been done.
4. The **Due date** passed, in red.

- Use **Block** when the fix depends on something external: material, third parties, area clearance. The reason is required.
- Blocking does not stop the clock: a blocked item with the **Due date** passed counts as **overdue**. Adjust the date in **Edit** when the new deadline is agreed.
- When leaving the block, the reason leaves the item page and stays only in the history.

6.5 Won't fix

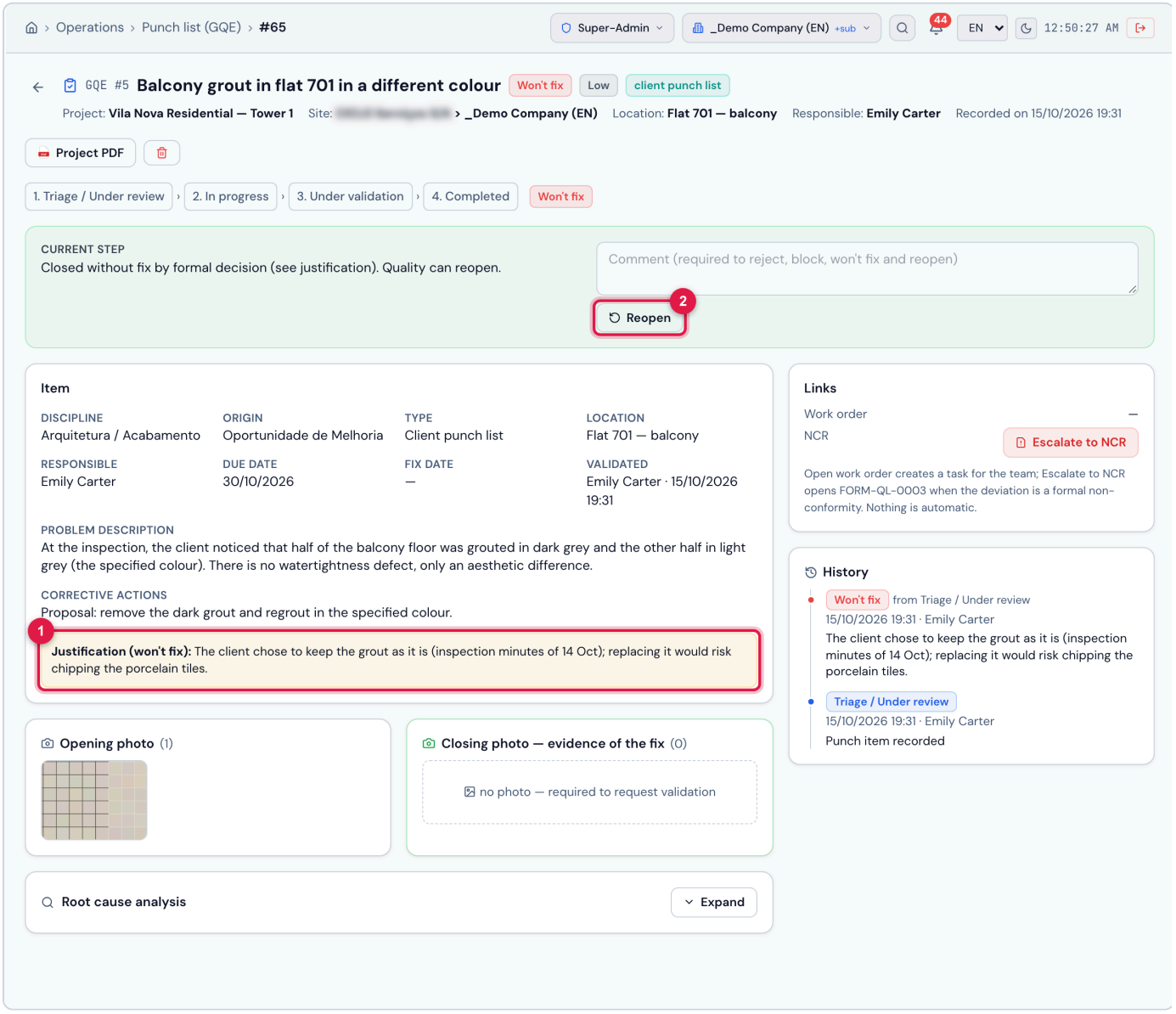


Figure 11. GQE #5 "Balcony grout in flat 701 in a different colour", **Won't fix**: closed without a fix, with the justification — a Quality decision.

1. The **Justification (won't fix)**.
2. **Reopen**, if the decision changes.

Use it when the deviation will not be fixed by formal decision: risk accepted by the client, an item that no longer exists in the design, an item that turned out to be false. The justification is required and goes into the PDF.

6.6 Notices in the bell and by e-mail

When	Who receives it	In the bell
a responsible is assigned — when recording with a responsible, when changing the responsible in **Edit** and when a commissioning failure opens the item with the technician	the new responsible	**You are responsible for GQE punch item #n**
Open work order	the responsible	**WO #m opened for GQE punch item #n**
Request validation	those with **Validate (Quality)** on the item's site — except the requester	**GQE punch item #n awaiting validation**, while it is **Under validation**
Reject	the responsible, with the assessment	**Validation rejected — GQE punch item #n**
Validate and complete	the responsible	**GQE punch item #n completed**

- The bell and the e-mail come in the recipient's language. Whoever performed the action never receives their own notice — a responsible who records their own item, for example, is not notified about themselves.
- Clicking the bell notice opens the item page. Notices to the responsible stay in the bell for 7 days, while they make sense (they are still the responsible and the item is still in the status of the notice).
- The e-mails follow the notification rules of type **Punch item (GQE)** in **System › Notifications** — **Apontamentos (GQE): responsável designado** and the other four (rule names are shown in Portuguese) —, with the recipients **Punch item responsible (GQE)** and **Validators (Quality) of the punch item site**. The administrator can deactivate a rule or add recipients.
- The responsible only receives notices if they can see the item's site.

7. Work order and Escalate to NCR

The **Links** box of the item page connects the item to two other H2O records. Both are only created by button — nothing is escalated automatically:

Button	Creates	Use it when	Right
Open work order	a ticket for the team to handle the fix	the fix is a job to be scheduled, with a technician, time and notes	**Edit**
Escalate to NCR	an NCR (FORM-QL-0003) already filled in and its treatment ticket	the deviation is a formal non-conformity — from a supplier, from a manufacturer, a recurring one — and needs root cause analysis and corrective action	**Edit** and **Create** in NCR

7.1 Open work order

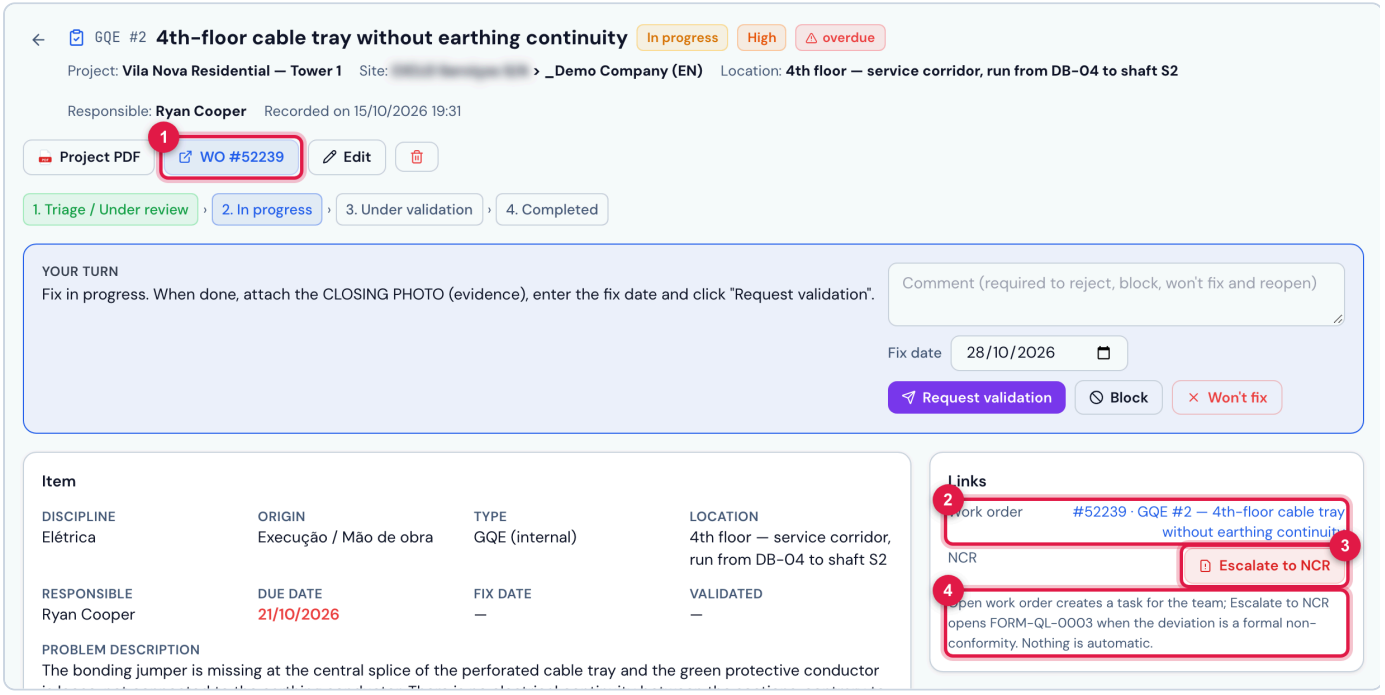


Figure 12. GQE #2 "4th-floor cable tray without earthing continuity", with the work order open: the work order number in the header and in the **Links** box.

1. **WO #n** in the header — opens the ticket.
2. **Work order** in **Links**, with the number and the name.
3. **Escalate to NCR**.
4. The tip: **Open work order** creates a task for the team; **Escalate to NCR** opens FORM-QL-0003 — nothing is automatic.

- **Open work order** asks **Open a work order for this item (technician = responsible)?** and creates the ticket **GQE #n — <title>**, with the description, the actions and the location of the item, written in the language of the person who opens it.
- The technician of the work order is the item's **responsible** (the work order is created **Assigned**); with no responsible, it is created **New**. The priority follows the item: Critical → Very high, High → High, Medium → Medium, Low → Low.
- The work order goes to the apps right away: the technician finds it in the app's ticket list, like any ticket assigned to them.
- The work order is created with no category and no location, and does not go through the company's automatic ticket rules (nor the new-ticket notices): complete the ticket if your routine uses them. The

responsible receives the item notice — **WO #m opened for GQE punch item #n** — in the bell and by e-mail (chapter 6).

- An item has only one work order. The button disappears when the item is **Completed** or **Won't fix**.
- If the work order is **cancelled** (**Cancel ticket** button on the ticket page), the item stays linked to it: the **Links** box keeps showing the work order and the **Open work order** button does not come back. Another work order cannot be opened for the same item — the server refuses with **This punch item already has a work order**. Keep this in mind before cancelling the work order of an item that is still open.
- The work order and the item are independent: solving the work order does not complete the item. Completion is still up to Quality, with the closing photo.
- The work order number appears in the PDF, in the **Links** block of the item (as **WO**).

7.2 Escalate to NCR

Escalating asks for confirmation — **Escalate this item to an NCR? Opens the pre-filled FORM-QL-0003 (fact, evidence, photos, asset supplier) and a treatment ticket.** — and shows the code of the NCR created (**RNC-YYYY-NNNN created**).

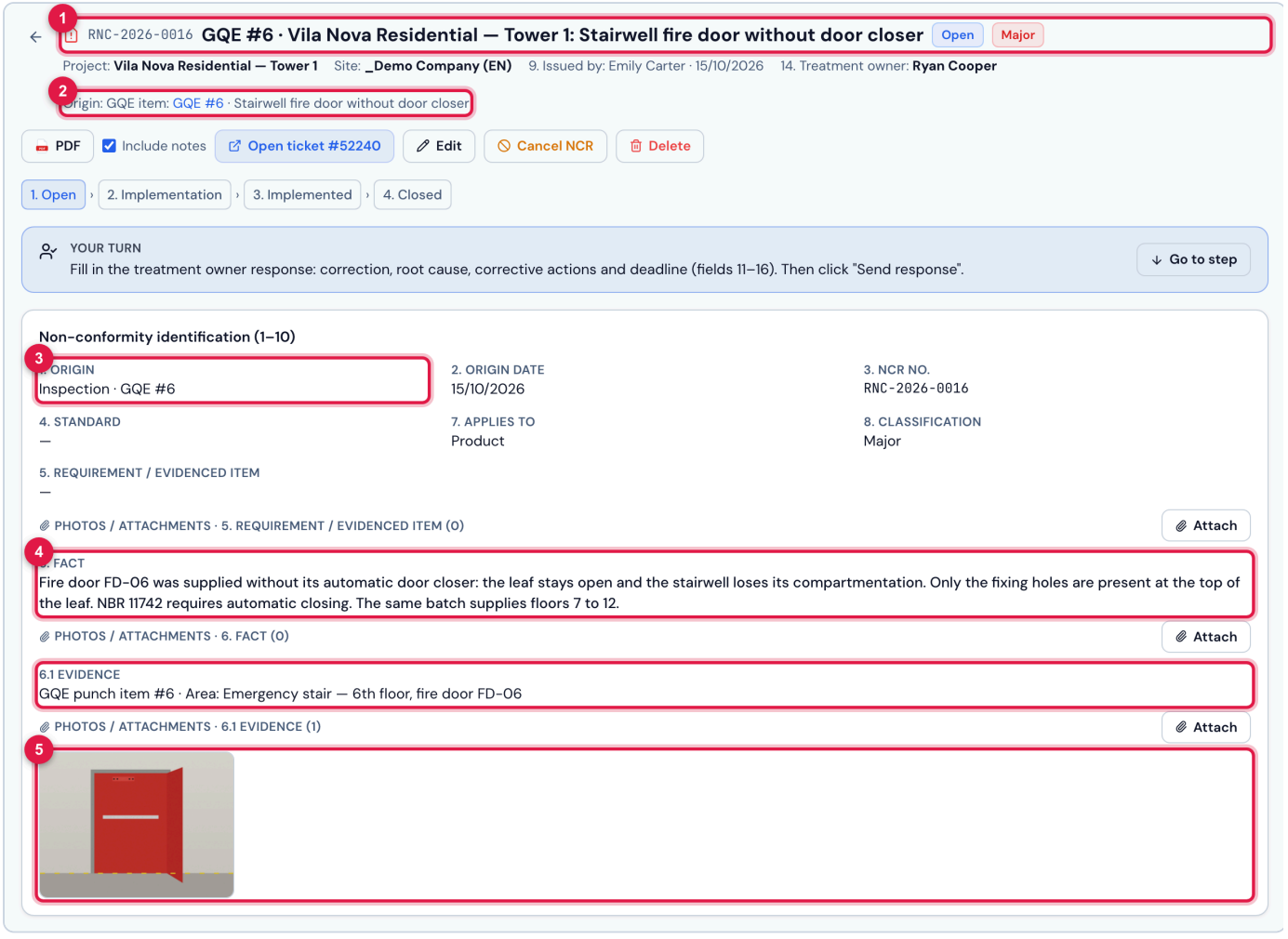


Figure 13. RNC-2026-0016, opened from **GQE #6** "Stairwell fire door without door closer" (Critical priority → **Major** classification): title, origin, fact and evidence coming from the item, and the way back to it.

1. The code **RNC-YYYY-NNNN**, the title **GQE #n · <project>: <title>** and the state.
2. **Origin: GQE item** GQE #n — goes back to the item page.
3. **1. Origin**: **Inspection** and the origin report number **GQE #n**.
4. **6. Fact** and **6.1 Evidence**, coming from the item.
5. The photos of the item, attached to the NCR.

NCR field	Comes from the item
Title	**GQE #n · <project>: <title of the item>**
1. Origin	**Inspection**; origin report number **GQE #n**; date = the date the item was recorded
6. Fact	the **Problem description** (or the title, if the description is empty)
6.1 Evidence	**GQE punch item #n · Area: …**
7. Applies to / **8. Classification**	**Product** / **Major** when the priority is Critical or High, **Minor** otherwise — adjust later if needed
Treatment owner	the item's **Responsible** — the NCR is created in the **Open** state. With no responsible, it is created **To delegate**.
Deadline	the item's **Due date**
Photos	the opening and closing photos (the same files, not copies)
Treatment ticket	a new ticket; when the item has a work order, it is created as its child

- The item now shows the NCR code in **Links** and in the header, and the history records **Escalated to NCR RNC-…**. The item status **does not change**: the fix on site is still handled here, and the formal treatment (owner response, actions, evaluation) follows in the NCR, in **Quality › NCR**.
- An item escalates only once: **This item was already escalated (RNC-…)**.
- An escalated item cannot be deleted. A photo deleted from the item after the escalation stays in the NCR.
- Escalating is available in any status — even after completion, when the deviation recurs and Quality wants to open the formal treatment.

> **System rule.** The item opened by a **commissioning** failure escalates with other rules — origin **Test**, classification **Minor**, no owner (**To delegate**) and with the supplier of the asset (chapter 8).

8. Items from a commissioning failure

In **commissioning**, each test is a ticket task linked to a phase of the project. When the technician completes the task with the result **Failed** — on the web or in the app —, H2O by itself opens **an item** on the project and a **retest task** on the same ticket. On the web, the message is **Failed: GQE item #n and retest task #m opened**. The full process is in the manual Commissioning, chapter 7; here is what changes in the item.

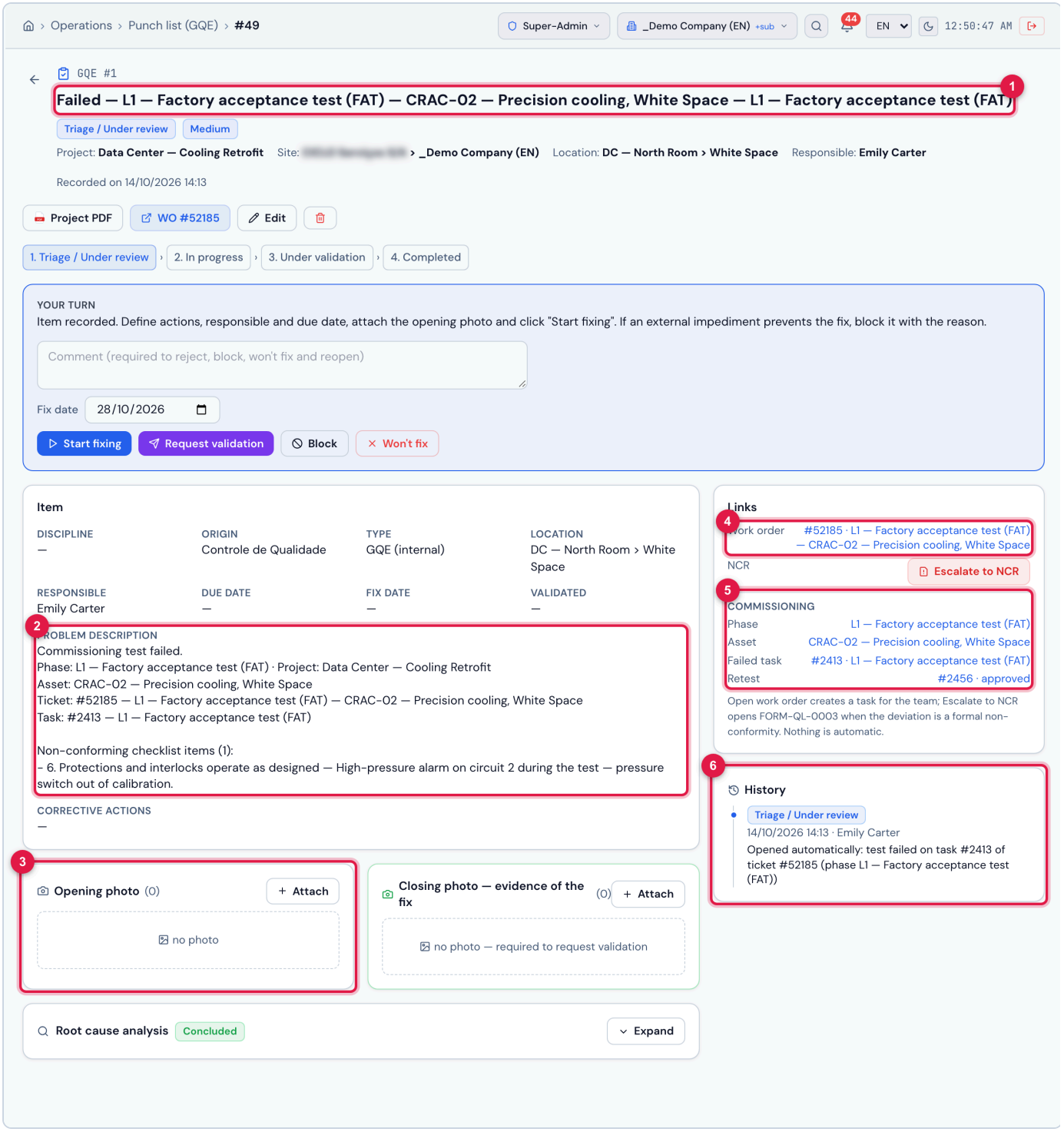


Figure 14. GQE #1, opened by the failure of the factory test of **CRAC-02** on the project **Data Center — Cooling Retrofit**, with the retest already approved.

1. The title built by H2O: **Failed — <phase> — <asset> — <task>**.
2. The description: **Commissioning test failed.**, phase, project, asset, ticket, task and the non-conforming checklist items.
3. **Opening photo** — the photos of the test checklist (this test had none: the box shows **no photo**).
4. **Work order** — the test ticket.
5. The **Commissioning** block: **Phase**, **Asset**, **Failed task** and **Retest**, with its status.
6. The history: **Opened automatically: test failed on task #… of ticket #… (phase …)**.

Item field	Comes from
Project	the project of the phase

Item field	Comes from
Title	**Failed — <phase> — <asset> — <task>**
Problem description	the test summary and the **Non-conforming** checklist items, with their comments
Type / **Origin**	**GQE (internal)** / **Controle de Qualidade**, when that origin exists and is active on the **Lists** page
Priority	the ticket's: Very high or Critical → **Critical**; High → **High**; Medium → **Medium**; the others → **Low**
Responsible	the ticket technician — who receives the responsible-assigned notice, unless they were the one who failed the test
Location	the location of the asset
Due date	empty — set it in **Edit**
Opening photo	the checklist photos of the failed task (the same files, not copies)
Status	**Triage / Under review**

8.1 What is different about this item

- The **Work order** already comes filled in with the test ticket — that is why **Open work order** does not show.
- The **Commissioning** block in **Links** leads to the **Phase** (**Commissioning** tab of the project), the **Asset**, the **Failed task** and the **Retest**, with its status: **to do**, **completed**, **approved** or **failed**.
- The retest and the item are independent: approving the retest does not complete the item, and completing the item does not approve the retest. Handle the item until **Completed**, with the closing photo of the fix, like any other.
- One item per failed task: while its item is open, failing the same task again does not create another. A failed retest is another task — and opens its own item.
- The items of the asset appear in the asset's **Dossier PDF** (manual Commissioning, chapter 8).

8.2 Escalate to NCR in commissioning

The button is the same as in chapter 7, but the NCR comes out with the test rules:

NCR field	Commissioning item
1. Origin	**Test**; origin report number **Commissioning · GQE #n**
6.1 Evidence	the item, the phase, the asset, the task, the ticket and the non-conforming checklist items
8. Classification	**Minor** (adjust later if needed)
Company (optional)	the supplier of the asset (**Asset Management** tab of the asset), when there is one
Treatment owner	none — the NCR is created **To delegate**
Treatment ticket	a child of the test ticket

9. Reports: PDF and spreadsheet

The report is always **for one project** and comes from two places: from the project row in the **Projects with items** table — **PDF** button and **Spreadsheet** icon —, taking the list filters; or from the page of any item, through the **Project PDF** button, with the whole project. The text comes out in the language of your screen and the dates in the company date format.

9.1 The PDF options

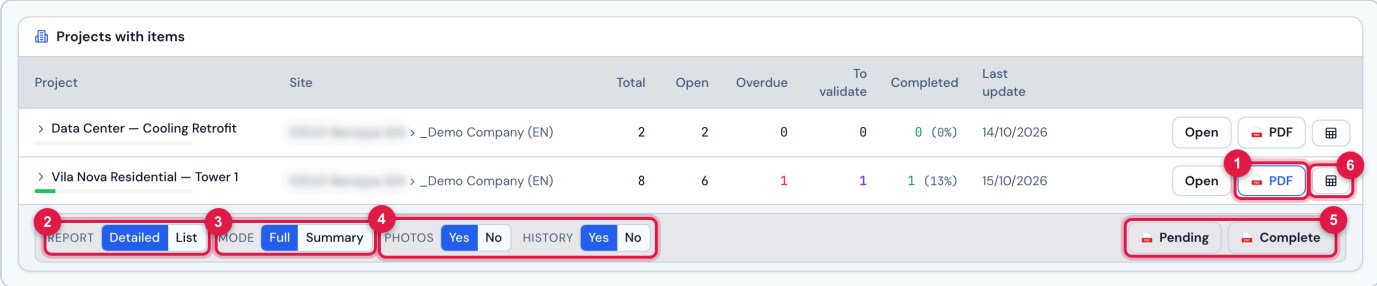


Figure 15. The **PDF** button of the **Vila Nova Residential — Tower 1** row opens the options right below it.

1. **PDF** — opens and closes the panel.
2. **Report**: **Detailed** (one block per item) or **List** (one row per item).
3. **Mode**: **Full** or **Summary** (Detailed only).
4. **Photos** and **History**: **Yes** / **No** (History only in the full Detailed report).
5. **Pending** and **Complete** — generate the PDF.
6. The **Spreadsheet** icon — downloads the CSV.

Button	Which items	What for
Pending	the open ones — **Triage / Under review**, **In progress**, **Under validation** and **Blocked** — within the list filters	follow up with the team or the supplier
Complete	all items of the filter, in any status	the project handover, with the acceptance

Option	What changes
Detailed · Full	each item with data, description, actions, notes, block reason or justification, **Links** (work order and NCR), all opening and closing photos side by side, the other attachments by name and the **HISTORY**; at the end, the **3. ACCEPTANCE**
Detailed · Summary	each item with only the header, the first data line and the photos — no long texts and no history
List	landscape page, one row per item, with the first opening photo and the first closing photo as thumbnails; no acceptance. Made for projects with hundreds of items
Photos: No	removes the photos (the PDF gets much smaller)
History: No	removes the history of each item

System rule. From the project row, the PDF follows the list filters: **Search…**, **Priority**, **Discipline**, **Origin**, **Type**, **Responsible…** and the **Overdue** card. A status chosen in the filter adds to the button (**Pending** + **Completed** brings nothing). The **Filter** line of the PDF says what was applied. Through **Project PDF**, on the item page, all items of the project come out.

9.2 What the PDF brings

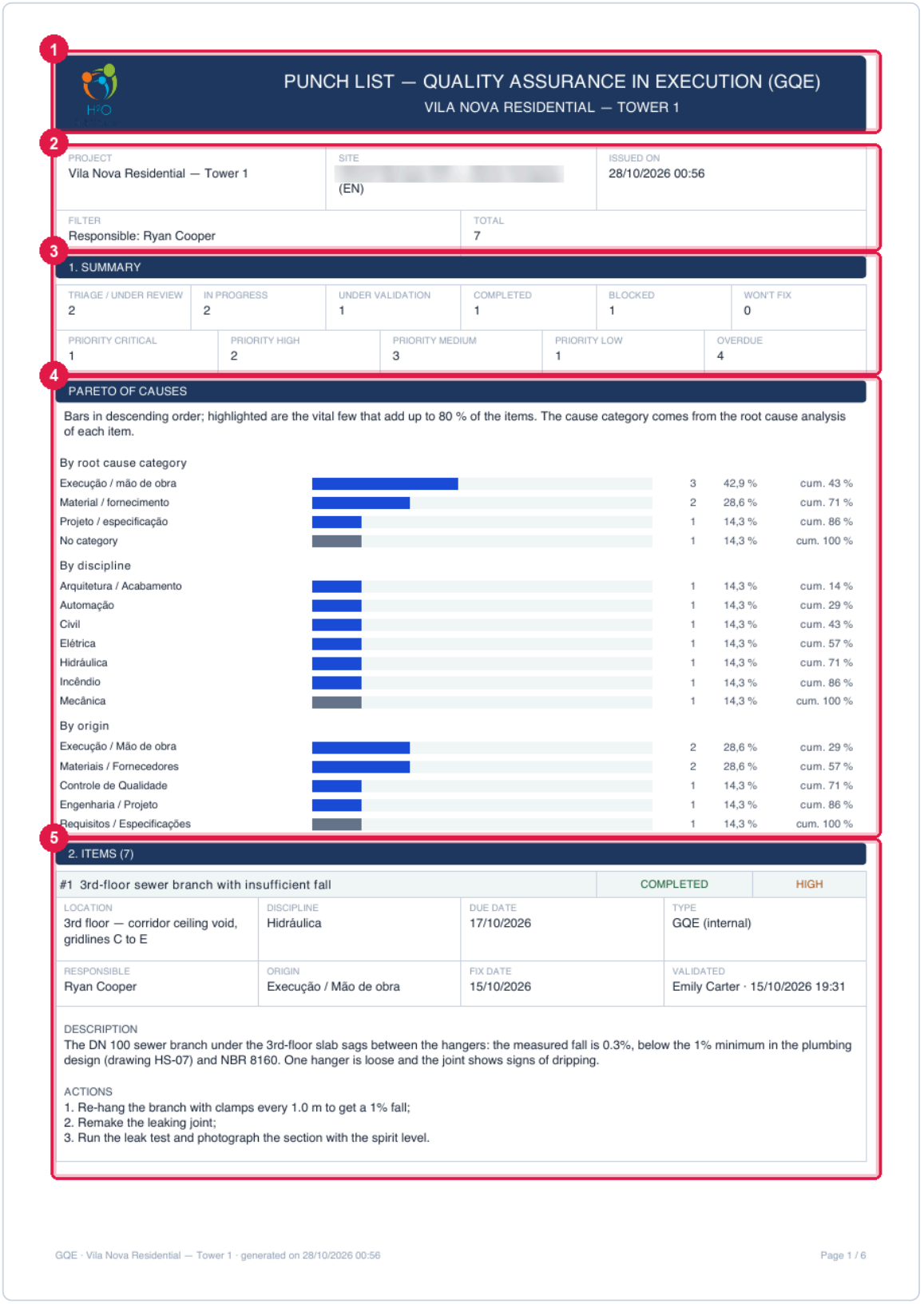


Figure 16. Complete PDF, **Detailed**, page 1, generated from the project row with the filter **Responsible…** = Ryan Cooper: the header, the summary and the first item.

1. The header with the company logo, **PUNCH LIST — QUALITY ASSURANCE IN EXECUTION (GQE)** and the project name.
2. **Project**, **Site**, **Issued on**, **Filter** and **Total**.
3. **1. SUMMARY**: how many in each status, in each priority and the **Overdue** ones.
4. **PARETO OF CAUSES**: bars by root cause category, by discipline and by origin (chapter 11).

5 **2. ITEMS** and the first block — the photos and the history continue on page 2.

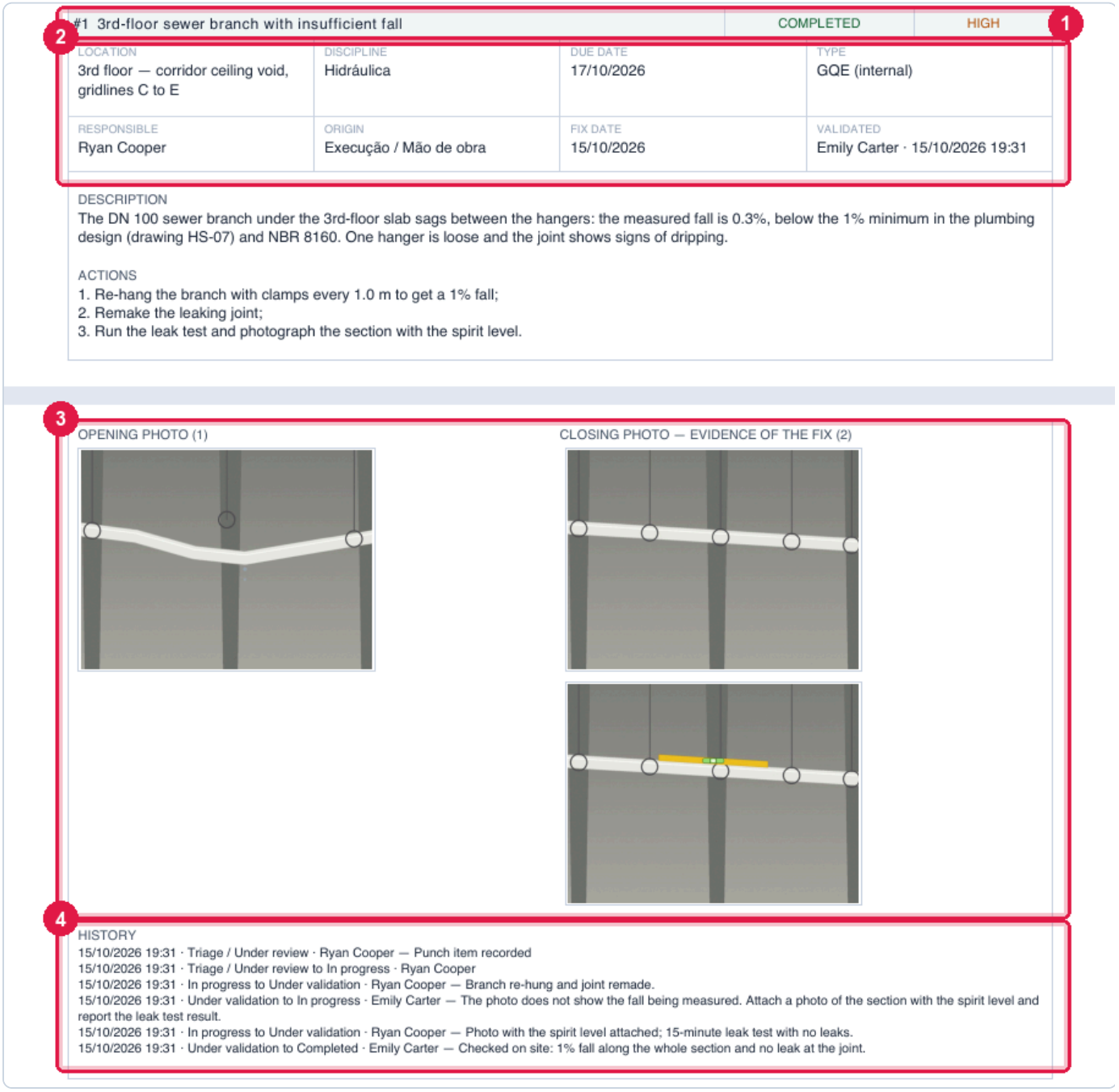


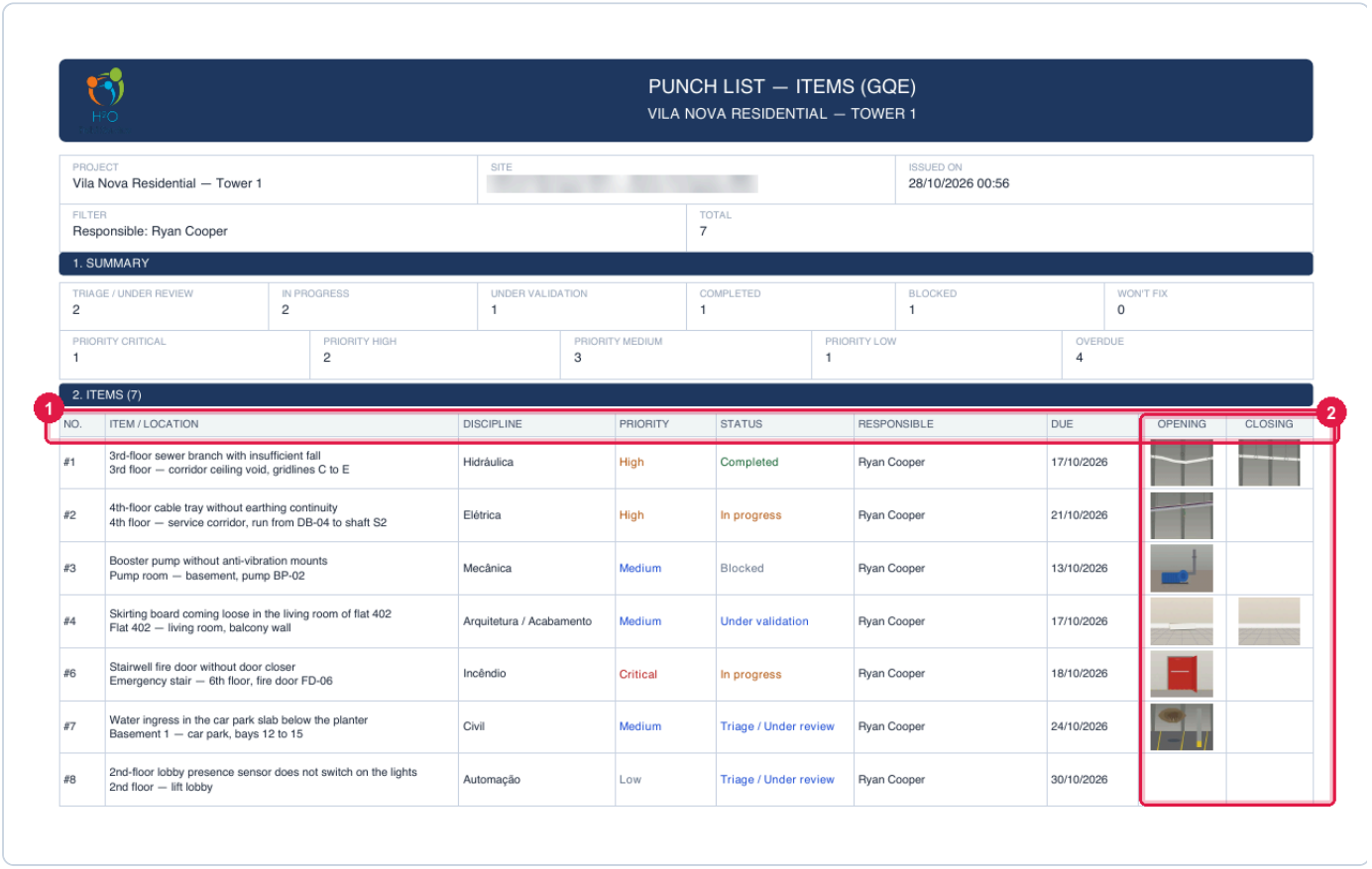
Figure 17. The block of **GQE #1** (completed): data, texts, **OPENING PHOTO** and **CLOSING PHOTO — EVIDENCE OF THE FIX** in pairs, and the **HISTORY** with the rejection.

1. Number, title, status and priority.
2. **Location**, **Responsible**, **Due date**, **Fix date** and **Validated**.
3. The opening and closing photos, in pairs — all of them.
4. The **HISTORY**, with date, person and comment of each step.



Figure 18. The last page of the Detailed report: **3. ACCEPTANCE**, with the handover signature lines.

1. The acceptance text: the **COMPLETED** ones have the fix proven by photo; the others remain under treatment.
2. **Quality (contractor)** and **Client / Inspection** — **Name / role / date**.



PUNCH LIST — ITEMS (GQE)
VILA NOVA RESIDENTIAL — TOWER 1

PROJECT	SITE	ISSUED ON
Vila Nova Residential — Tower 1		28/10/2026 00:56

FILTER	TOTAL
Responsible: Ryan Cooper	7

1. SUMMARY

TRIAGE / UNDER REVIEW	IN PROGRESS	UNDER VALIDATION	COMPLETED	BLOCKED	WON'T FIX
2	2	1	1	1	0

PRIORITY CRITICAL	PRIORITY HIGH	PRIORITY MEDIUM	PRIORITY LOW	OVERDUE
1	2	3	1	4

2. ITEMS (7)

NO.	ITEM / LOCATION	DISCIPLINE	PRIORITY	STATUS	RESPONSIBLE	DUE	OPENING	CLOSING
#1	3rd-floor sewer branch with insufficient fall 3rd floor — corridor ceiling void, gridlines C to E	Hidráulica	High	Completed	Ryan Cooper	17/10/2026		
#2	4th-floor cable tray without earthing continuity 4th floor — service corridor, run from DB-04 to shaft S2	Elétrica	High	In progress	Ryan Cooper	21/10/2026		
#3	Booster pump without anti-vibration mounts Pump room — basement, pump BP-02	Mecânica	Medium	Blocked	Ryan Cooper	13/10/2026		
#4	Skirting board coming loose in the living room of flat 402 Flat 402 — living room, balcony wall	Arquitetura / Acabamento	Medium	Under validation	Ryan Cooper	17/10/2026		
#6	Stairwell fire door without door closer Emergency stair — 6th floor, fire door FD-06	Incêndio	Critical	In progress	Ryan Cooper	18/10/2026		
#7	Water ingress in the car park slab below the planter Basement 1 — car park, bays 12 to 15	Civil	Medium	Triage / Under review	Ryan Cooper	24/10/2026		
#8	2nd-floor lobby presence sensor does not switch on the lights 2nd floor — lift lobby	Automação	Low	Triage / Under review	Ryan Cooper	30/10/2026		

Figure 19. The PDF as a **List**: **PUNCH LIST — ITEMS (GQE)**, one row per item, with the thumbnails (the same filter **Responsible…** = Ryan Cooper).

1. The columns **No.**, **Item / location**, **Discipline**, **Priority**, **Status**, **Responsible** and **Due**.
2. **Opening** and **Closing** — the first photo on each side.

- Nothing is cut: a long title wraps, and all photos go in, in pairs (opening × closing); when they do not fit on the page, they continue on the next one with **(continued)**.
- An attachment that is not an image — a PDF in the closing panel, for example — shows by its file name, under **OTHER OPENING ATTACHMENTS** or **OTHER CLOSING ATTACHMENTS** (in the **List**, under **Attachments:** below the title).
- The acceptance is meant to be printed and signed by hand at the handover inspection — H2O does not collect those signatures.

- Large projects take longer to generate: wait for the file to open.

9.3 The spreadsheet

The **Spreadsheet** icon downloads a CSV (semicolon-separated, opens directly in Excel) with the project items that are in the list — the same filters, status included. With the initial **Open** filter, only the open ones come out; for the whole project, first click the **Project total** card (or choose **All statuses**).

Columns (in the screen language)
project · site · no · type · item · location · discipline · origin · priority · status · description · actions · responsible · due_date · fix_date · validated_by · validated_at · block_reason · work_order · ncr · created_at · notes

> **Tip.** Status, priority and type come out translated and the dates in the company format. Use the spreadsheet to filter in Excel or take it to Power BI: by discipline, by responsible, by origin, by time between recording and validation.

9.4 Root cause analysis and Pareto in the PDF

The **detailed** PDF brings the **Pareto of causes** section — by root cause category, by discipline and by origin — and, on each item, the **Root cause analysis** block with the text of each method; the **summary** does not include them. The on-screen Pareto and the three methods are in chapter 11.

10. Disciplines and origins

Discipline and **Origin** are lists your company maintains. They are on the **Lists** page, a button at the top of the punch list screen (needs **Edit**). Both lists apply to all companies and sites of your H2O.

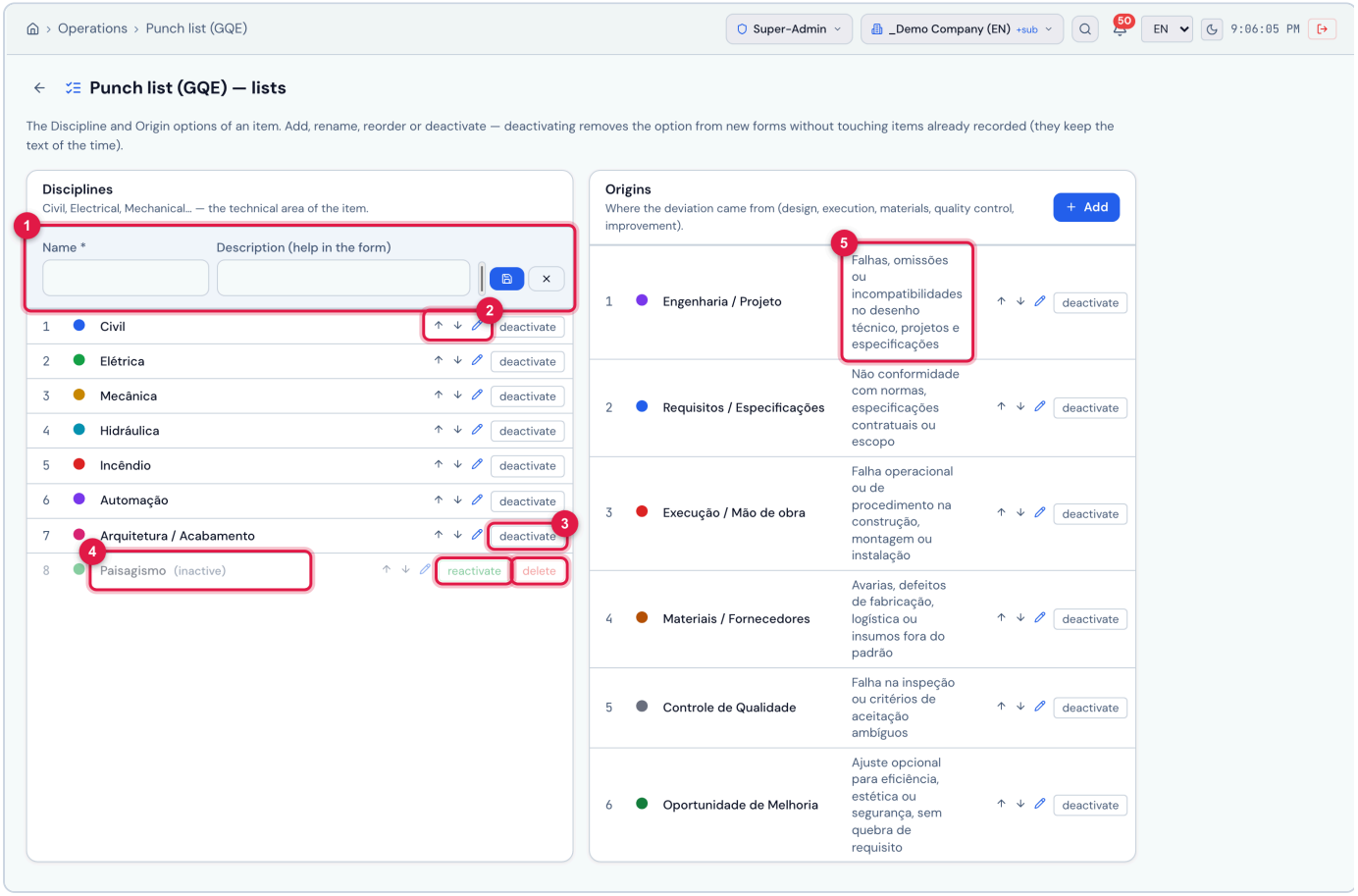


Figure 20. The **Punch list (GQE) — lists** page: **Disciplines** on the left, **Origins** on the right.

1. **Add** — **Name**, **Description (help in the form)** and the color.
2. The **move up** / **move down** arrows change the order in the forms; the pencil renames.
3. **deactivate** removes the option from new forms; **reactivate** brings it back.
4. An inactive entry, greyed out in the list, with **delete**.
5. The description of the origin — it is what appears below the **Origin** field when recording.

List	Comes with (names as registered at the factory, in Portuguese)
Disciplines	Civil, Elétrica, Mecânica, Hidráulica, Incêndio, Automação, Arquitetura / Acabamento (civil, electrical, mechanical, plumbing, fire, automation, architecture / finishes)
Origins	**Engenharia / Projeto** (flaws, omissions or clashes in the drawings and specifications) · **Requisitos / Especificações** (standards, contract, scope) · **Execução / Mão de obra** (operational or procedural failure) · **Materiais / Fornecedores** (damage, manufacturing defects, off-standard supplies) · **Controle de Qualidade** (inspection failure or ambiguous criterion) · **Oportunidade de Melhoria** (optional adjustment, no requirement broken)

- The item keeps the **text** of the discipline and the origin of the time: renaming or deactivating an entry does not change items already recorded.
- **delete** only shows on a **deactivated** entry, and only works if no item ever used that name — otherwise: **Item in use on punch items — deactivate it instead of deleting.**

- Two entries with the same name in the same list are not accepted: **An item with this name already exists**.
- The names are not translated: they appear as they were registered, in any screen language, in the form, the filters, the item page, the PDF and the spreadsheet.

> **System rule.** The **Controle de Qualidade** origin is the one H2O uses on items opened by a commissioning failure (chapter 8). If it is renamed or deactivated, those items use the first active origin that has "Qualidade" in its name — or are created with no origin.

11. Root cause analysis and Pareto

Fixing the item solves the symptom. So that the deviation does not come back, the item page (and the NCR detail) has the **Root cause analysis** block, with three classic quality methods — **5 Whys**, **Ishikawa** and **FMEA** — and, on the project page, the **Pareto**, which shows where the causes concentrate. It is what data center owners ask for in commissioning: the origin of every recorded failure, not only the fix.

- Each method is **a separate analysis** of the same item: you can have all three side by side. Every analysis has the **problem** statement, the method lines, the **root cause**, the **cause category** (editable list, chapter 10), the **corrective action** and the **preventive action**.
- The analysis stays **In progress** while it is written; **Conclude analysis** checks the minimum of the method, records who concluded and locks editing; **Reopen** unlocks it. **Delete** removes the analysis from the page (the other methods stay).
- Whoever can edit the item — **Edit** right or being the responsible, with the item open — fills in the analysis; everyone else only reads. On the NCR, whoever answers or edits the NCR.
- The block opens expanded; **Collapse** / **Expand** on the right corner.

> **System rule.** An item born from a **commissioning failure** (chapter 8) is only **completed** after a **concluded** root cause analysis: the page shows the **required to complete** badge and, when trying **Validate and complete** without it, Quality gets **Conclude a root cause analysis before completing this item (commissioning failure).** On the other items and on the NCR the analysis is optional — nothing blocks.

11.1 5 Whys

The quickest method: it starts from the fact and asks **why?** until it reaches the cause that, once fixed, prevents recurrence — usually in five steps, sometimes fewer, sometimes more. Click **5 Whys** and **Start analysis**; the problem statement comes filled with the item title.

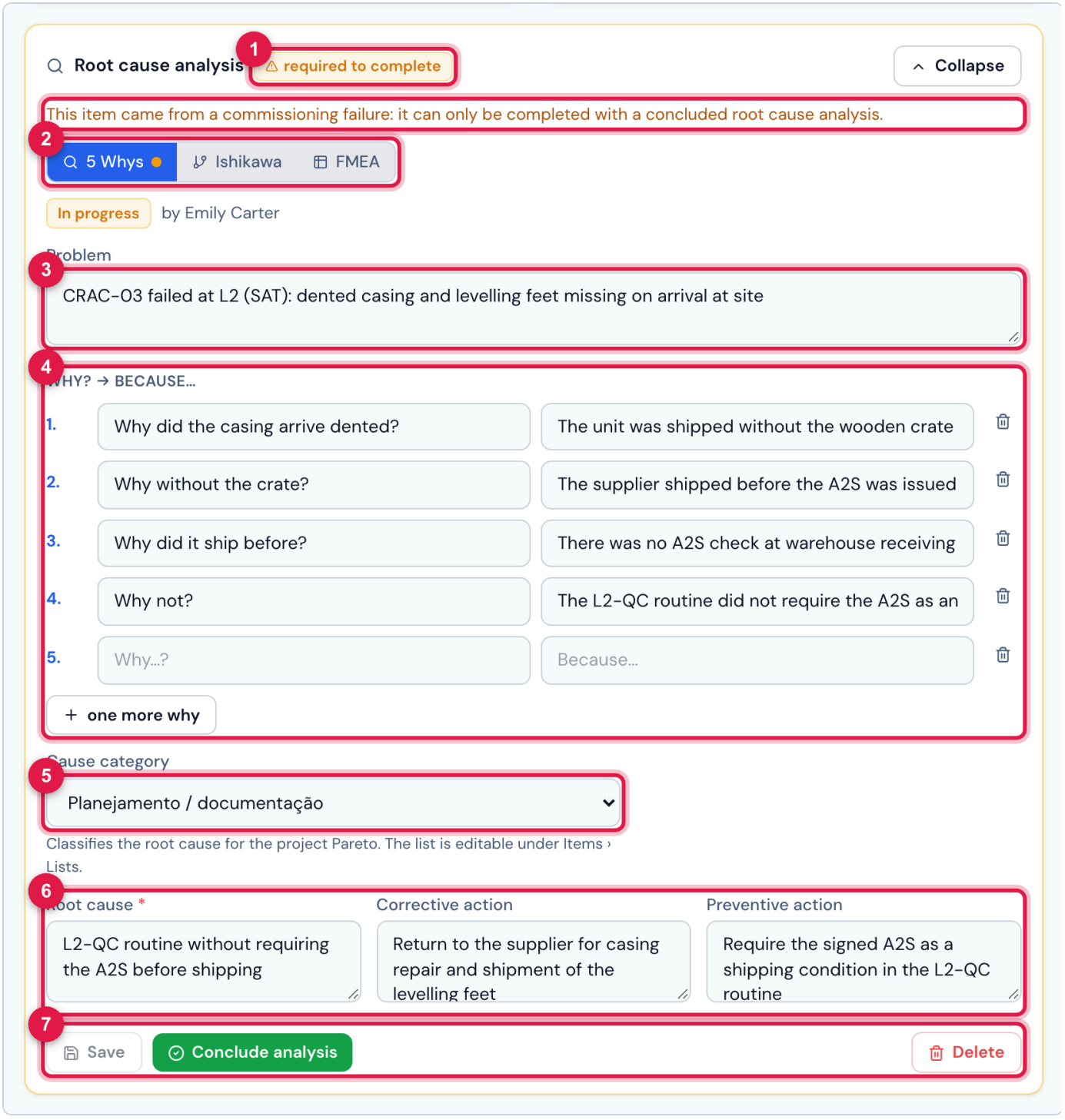


Figure 21. The **Root cause analysis** block of the item opened by the CRAC-03 failure at L2, in the **5 Whys** method, still **in progress**.

1. The **required to complete** badge and the warning: this item came from a commissioning failure and is only completed with a concluded analysis.
2. The three methods; the dot next to the name says whether that method's analysis is **In progress** (amber) or **Concluded** (green).
3. The **Problem**: what happened, where and when — the fact, not the cause.
4. The **Why?** → **Because…** chain: each line asks about the previous answer. **one more why** adds a line; the bin removes it.
5. The **Cause category** (chapter 10, Lists) — it feeds the Pareto by cause.
6. **Root cause** (required to conclude), **Corrective action** and **Preventive action**.
7. **Save**, **Conclude analysis** and **Delete**. Once concluded, the analysis shows **Reopen** instead of Save/Conclude.

- **Conclude** requires the **root cause** written and at least one **answered why**; if missing, the message says which (**Enter the root cause before concluding** / **Answer at least one why**). Empty lines are not saved.
- Write the problem as an observable fact ("CRAC-03 failed at L2: dented casing and levelling feet missing"), not as a judgement. Stop when the answer points to something that **can be changed** — procedure, routine, training, design, supply.

11.2 Ishikawa (6M)

The cause-and-effect diagram organizes the possible causes in six bones — **Method**, **Machine**, **Material**, **Manpower**, **Measurement** and **Environment** — so the team does not forget any family of cause. It suits the analysis meeting, with several people raising hypotheses.

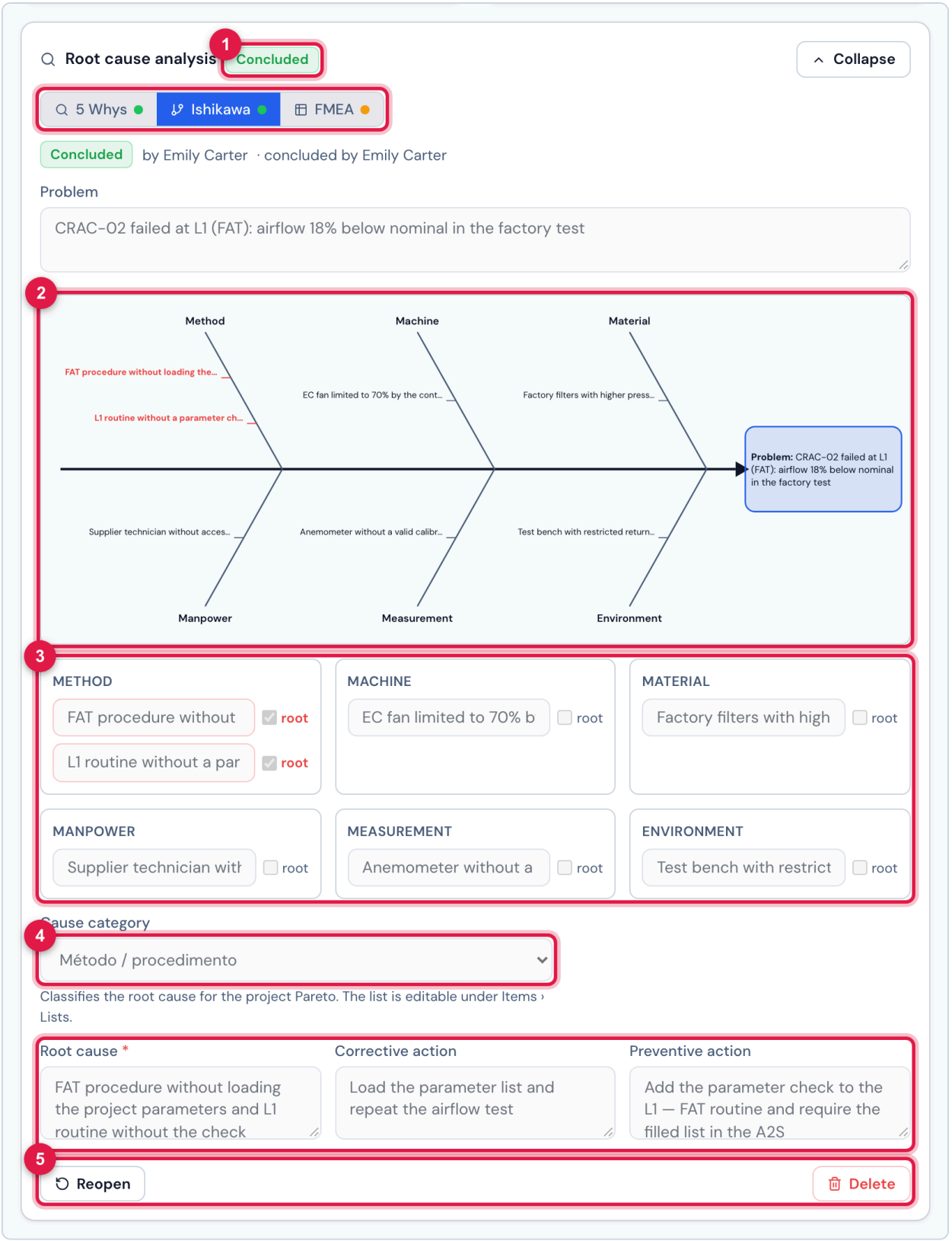


Figure 22. The item of the CRAC-02 failure at L1 in the **Ishikawa** method, already **concluded**: the diagram is drawn on the fly from the typed causes.

1. The **Concluded** badge on the block title (some analysis is concluded: the obligation is met) and the green dots on the concluded methods.
2. The fishbone diagram: three bones above, three below, the problem at the head; the causes marked as **root** come out in red.
3. One box per bone: the **+** opens a cause line; the **root** checkbox marks the cause that explains the problem; the bin removes it.
4. The **Cause category** and the closing fields, as in the 5 Whys.

5 On a concluded analysis, only **Reopen** and **Delete**; the fields are locked.

- **Conclude** requires the root cause written and **at least one cause marked as root** in the diagram (**Mark at least one root cause in the diagram**). The root cause text summarizes the marked ones.
- Unmarked causes stay in the diagram as discarded hypotheses — they are part of the record.
- The diagram shows up to six causes per bone; the others stay only in the list.

11.3 FMEA

The **FMEA** (Failure Mode and Effects Analysis) is the most complete analysis: it lists the possible **failure modes** of the equipment or installation, the **effect** of each one, the **cause**, the **current controls** and scores **Severity**, **Occurrence** and **Detection** from 1 to 10. The product **RPN = S × O × D** ranks what to treat first; the **recommended action** gets an owner and a due date and, once done, the line is **re-evaluated** (S′, O′, D′ → RPN′) to prove the risk went down.

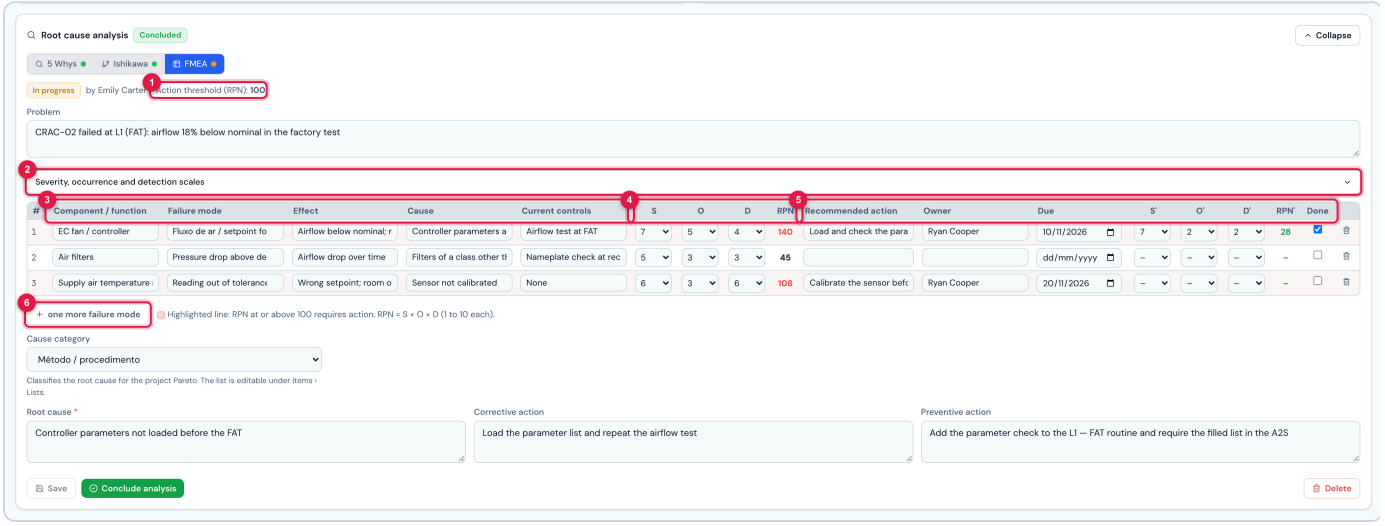


Figure 23. The **FMEA** method of the same item, in progress: one line per failure mode, with the computed RPN and the re-evaluation.

1 The company's **Action threshold (RPN)** (default **100**): a line with RPN at or above it is highlighted in red and requires action.

2 **Severity, occurrence and detection scales**: opens the table with the criterion of each score (the same text appears when hovering the chosen score).

3 The line: **Component / function**, **Failure mode** (suggests the catalog while typing; accepts free text), **Effect**, **Cause**, **Current controls**.

4 **S**, **O**, **D** and the computed **RPN**.

5 **Recommended action**, **Owner**, **Due date**; after the action, **S′ O′ D′** and the **RPN′**, plus the **Done** mark.

6 **one more failure mode** adds a line; the line's bin removes it.

- **Conclude** requires the root cause and at least one line with the three scores (**Register at least one failure mode before concluding.**). A blank score leaves the line's RPN at zero.
- The project **Pareto by RPN** (below) adds up the RPN of each failure mode; a line already re-evaluated counts with its **RPN′** (chapter 12).
- The scales, the failure mode catalog and the cause category are **company lists** (chapter 10): adjust the criteria to your procedure before using the FMEA at scale.

> **Tip.** The RPN threshold has no screen: it comes from the company setting `fmea_rpn_threshold` (default 100). Ask support to change it.

11.4 The project Pareto

With a project selected on the items screen (chapter 3), the **Pareto** card appears between the indicators and the list. It answers "where are the 80 %": bars in descending order and the cumulative line, on a single **%** axis, with the **80 %** reference; the **vital few** — the first bars, until crossing 80 % — are in the highlight colour.

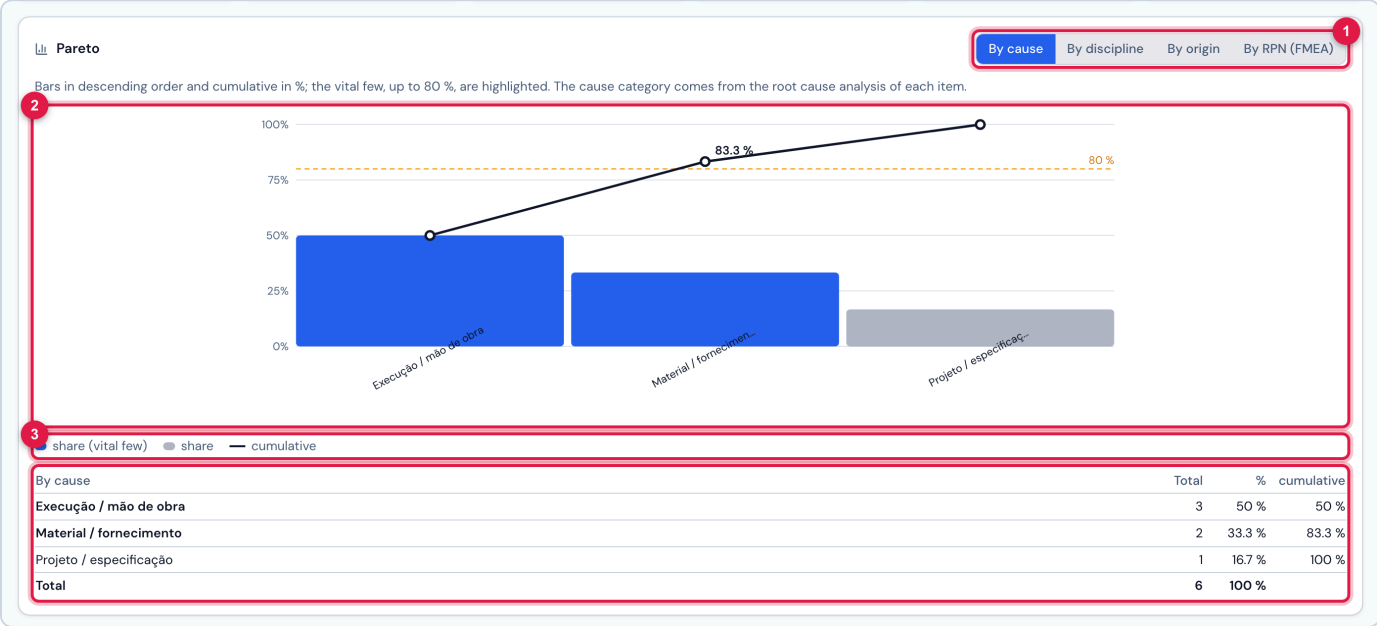


Figure 24. The project **Pareto by cause**: the root cause category of the analyses of each item.

1. The dimension: **By cause** (root cause category), **By discipline**, **By origin** or **By RPN (FMEA)**.
2. The bars (share of each label) and the **cumulative** line; the dotted line marks the **80 %** and the number is the point where the cumulative crosses it.
3. The legend and the table with the same numbers: count, share and cumulative.

- Hover a bar to see the count, share and cumulative of that label.
- **By cause** uses the category of the **most recent concluded analysis** of each item (without a concluded one, the most recent that has a category). An item without analysis counts as **No category** — the more analyses, the more useful the chart.
- The Pareto follows the **open only** chip of the list: on, it counts only the open items; off, all items of the project. The other list filters do not affect it.
- **By RPN** adds up the RPN of each failure mode of the project FMEAs (one label per failure mode).

11.5 In the reports

- The **detailed** project PDF (chapter 9) brings the **Pareto of causes** section — by root cause category, by discipline and by origin, in bars — and, on each item, the **Root cause analysis** block with the text of each method (whys, causes per bone with the roots, FMEA lines with S, O, D, RPN, action and re-evaluation). The **summary** PDF does not include the analysis.
- The **NCR** form (FORM-QL-0003) prints the analyses as **12a. Root cause analysis (RCA)**, right below field 12.
- The commissioning **asset dossier** shows, under each item, the **Root cause** line with the concluded analyses and the category.

11.6 The RCA and FMEA lists

In **Items › Lists** (chapter 10), besides the disciplines and origins, are the root cause analysis lists. H2O seeds a default set in each one; rename, reorder or deactivate as your procedure requires.

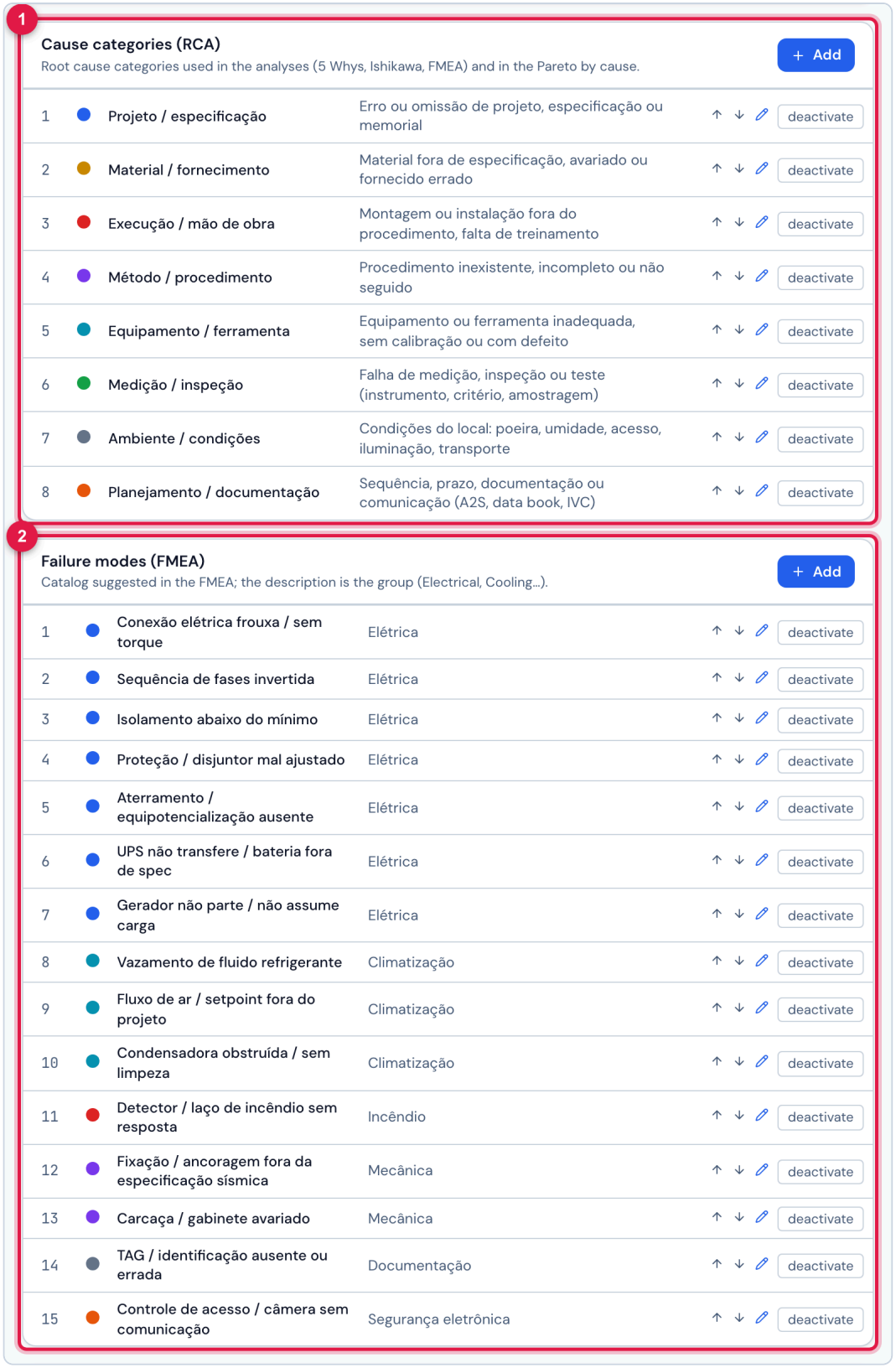


Figure 25. The **Cause categories (RCA)** and **Failure modes (FMEA)** lists in **Items › Lists** (the disciplines and origins sit above them on the screen, outside the crop).

1. **Cause categories (RCA)**: classify the root cause and feed the Pareto by cause.
2. **Failure modes (FMEA)**: the catalog suggested while typing the mode; the description is the group (Electrical, Cooling, Fire…).

Further down the same screen are the three FMEA scales — **Severity**, **Occurrence** and **Detection** —, one line per score from 1 to 10.

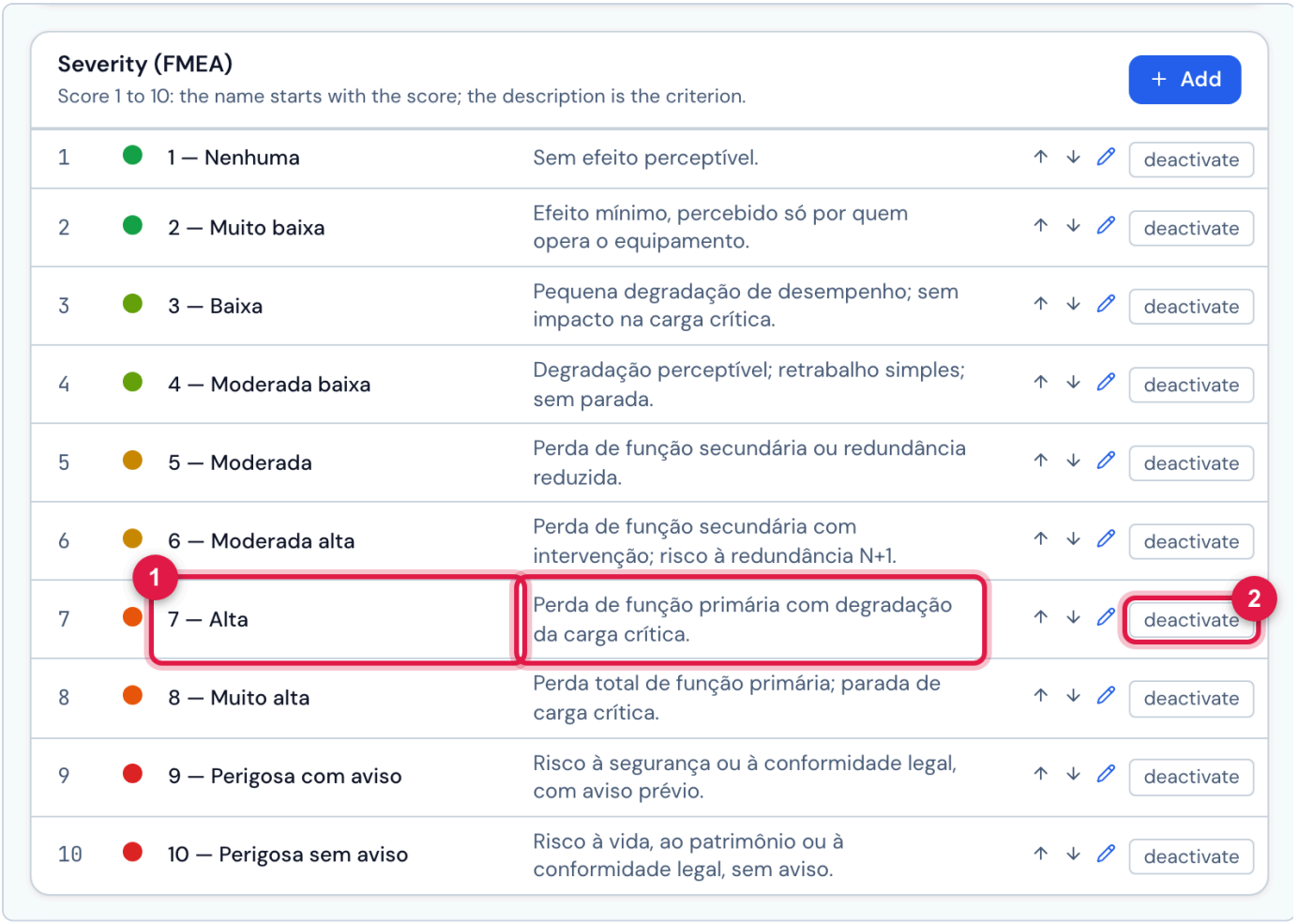


Figure 26. The **Severity (FMEA)** scale; Occurrence and Detection have the same shape.

1. The **name starts with the score** ("7 — Alta") and the **description is the criterion** the user sees when choosing the score in the FMEA.
2. **deactivate** removes the score from the selector without deleting the analyses that used it; **Add**, rename and reorder work as for the disciplines.

Warning. In the scales, keep the **score at the start of the name** ("7 — High"): the FMEA computes the RPN from it. Deactivating a score removes it from the selector; old analyses keep the score they used. Like the disciplines, these lists are **one company catalog, in Portuguese only**: on the English and Spanish screens the names appear as registered.

12. FMEA in practice

Chapter 11 introduced the **FMEA** as one of the three methods of the **Root cause analysis** block. This chapter is the user guide: how to score **Severity**, **Occurrence** and **Detection** with the company scales, how to read the **RPN** and the **action threshold**, how to record the **re-evaluation** after the action, and how the project **Pareto by RPN** turns the lines of several items into a priority list. The thread is the same item as in the previous chapter — the **CRAC-02 failed at L1 (FAT)** — and, for the re-evaluation, the **CRAC-03 failed at L2 (SAT)**.

- Use the FMEA when the item involves an **equipment or system** with several ways to fail — a CRAC, a switchboard, a UPS, a fire loop — and the question is not only "why did it fail?" but "**what else can fail, how badly, and what would catch it first**". For a simple execution deviation, the **5 Whys** are enough.
- The FMEA is the analysis that best survives time: the lines that stayed **below the threshold** remain on record as known and accepted risks, and the **re-evaluation** proves to the client that the recommended action reduced the risk — which is what commissioning inspection asks for.
- Everything that applies to the other methods applies here: whoever can edit the item fills it in; **Save** records, **Conclude analysis** locks, **Reopen** unlocks; an item born from a commissioning failure can only be completed with a concluded analysis.

> **Tip.** The three scales, the failure mode catalog and the threshold come from the company (section **The company lists**, below). The criteria transcribed in this chapter are the H2O **factory defaults**, AIAG-style adapted to critical infrastructure; if your Quality team rewrote them under **Items › Lists**, what is on screen prevails.

12.1 The three scales

Each FMEA line gets three scores from **1 to 10**. **Severity (S)** measures the **effect** if the failure happens — it does not change with the action, only with a design change. **Occurrence (O)** measures the probability of the **cause** — it drops when the cause is eliminated. **Detection (D)** measures the chance that the **current controls** catch the failure **before** it affects operation — and here the scale is inverted: **1 is the best** (always detected) and **10 the worst** (no control). The **Severity, occurrence and detection scales** button, right above the table, opens the three side by side; keep it open during the meeting.

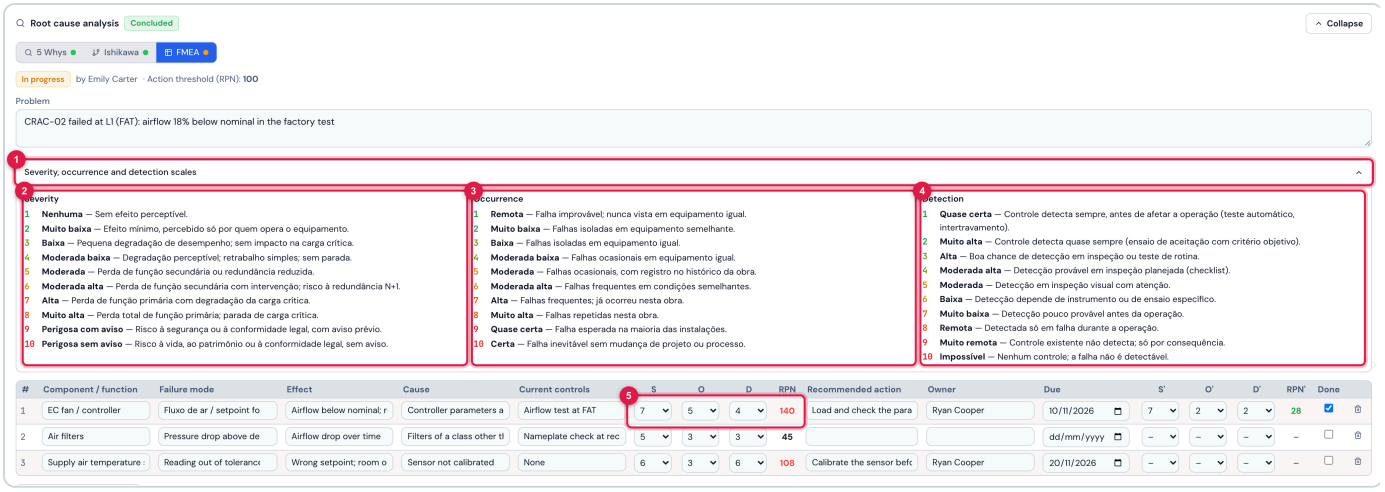


Figure 27. The FMEA of the item from the CRAC-02 failure at L1 with the **Severity, occurrence and detection scales** panel open: score, label and criterion of each scale, and the scores already given on the first line.

1. The **Severity, occurrence and detection scales** button, clicked: the panel opens below it; click again to collapse.
2. **Severity**: the score in color (green → red), the label and the criterion from 1 to 10.
3. **Occurrence**: same form, read from the line's cause.
4. **Detection**: 1 is the best control, 10 is none.
5. The **S**, **O** and **D** scores of the first line (7, 5 and 4) and the **RPN** 140, in red because it crossed the threshold; hovering the chosen score shows the criterion as a tooltip.

The default criteria, score by score (the company catalog is registered in Portuguese and the screen shows it as registered; the translation below is for reading). The score color in the panel follows the same ruler on the three scales: 1–2 green, 3–4 olive, 5–6 amber, 7–8 orange, 9–10 red.

Score	Severity — the effect, if the failure occurs	Occurrence — the probability of the cause	Detection — the chance that the current control catches it first
1	**None** — no perceptible effect.	**Remote** — failure unlikely; never seen on identical equipment.	**Almost certain** — the control always detects, before affecting operation (automatic test, interlock).
2	**Very low** — minimal effect, noticed only by whoever operates the equipment.	**Very low** — isolated failures on similar equipment.	**Very high** — the control almost always detects (acceptance test with an objective criterion).
3	**Low** — small performance degradation; no impact on the critical load.	**Low** — isolated failures on identical equipment.	**High** — good chance of detection in a routine inspection or test.
4	**Moderate low** — perceptible degradation; simple rework; no shutdown.	**Moderate low** — occasional failures on identical equipment.	**Moderate high** — detection likely in a planned inspection (checklist).
5	**Moderate** — loss of a secondary function or reduced redundancy.	**Moderate** — occasional failures, recorded in the project history.	**Moderate** — detection in a careful visual inspection.
6	**Moderate high** — loss of a secondary function requiring intervention; risk to the N+1 redundancy.	**Moderate high** — frequent failures under similar conditions.	**Low** — detection depends on an instrument or a specific test.

Score	Severity — the effect, if the failure occurs	Occurrence — the probability of the cause	Detection — the chance that the current control catches it first
7	**High** — loss of the primary function with degradation of the critical load.	**High** — frequent failures; already happened on this project.	**Very low** — detection unlikely before operation.
8	**Very high** — total loss of the primary function; critical load shutdown.	**Very high** — repeated failures on this project.	**Remote** — detected only as a failure during operation.
9	**Hazardous with warning** — risk to safety or legal compliance, with prior warning.	**Almost certain** — failure expected in most installations.	**Very remote** — the existing control does not detect; only by consequence.
10	**Hazardous without warning** — risk to life, property or legal compliance, without warning.	**Certain** — failure unavoidable without a design or process change.	**Impossible** — no control; the failure is not detectable.

- Score **Severity from the effect** written in the **Effect** column, **Occurrence from the cause** in the **Cause** column and **Detection from the controls** in the **Current controls** column — if that column is empty ("None"), Detection is 9 or 10. Filling the three text columns before the scores avoids scoring "by feel".
- Score **one line at a time, the three scores in sequence**, and do not compare RPNs halfway: the RPN is a consequence, not a target.
- A blank score leaves the line's **RPN** as **–** (zero): the line does not count for concluding nor for the Pareto until it has all three.

12.2 A complete example: the CRAC-02 failed at L1

The item from chapter 11 was born from the CRAC-02 failure at **L1 — FAT**: airflow 18% below nominal in the factory test. The FMEA meeting listed three failure modes — the one that failed and two the same test could have let through — and scored them like this:

#	Component / function	Failure mode	Effect	Cause	Current controls	S	O	D	RPN
1	EC fan / controller	Fluxo de ar / setpoint fora do projeto (catalog: airflow / setpoint off design)	Airflow below nominal; room without design capacity	Controller parameters at factory default	Airflow test at FAT	7	5	4	**140**
2	Air filters	Pressure drop above design	Airflow drop over time	Filters of a class other than specified	Nameplate check at receiving	5	3	3	45
3	Supply air temperature sensor	Reading out of tolerance	Wrong setpoint; room out of range	Sensor not calibrated	None	6	3	6	**108**

Why those scores — reading the scales, line by line:

- **Line 1 — S 7**: "loss of the primary function with degradation of the critical load" — a CRAC without the design airflow does not stop the room, but leaves the load without the contracted capacity. **O 5**: "occasional failures, recorded in the project history" — factory parameters had already shown up in another delivery. **D 4**: "detection likely in a planned inspection" — the FAT airflow test catches it, but only at the end, and it did. **RPN = 7 × 5 × 4 = 140**.

- **Line 2 — S 5**: reduced redundancy, no shutdown. **O 3**: isolated failures on identical equipment. **D 3**: the filter nameplate check at receiving is a routine inspection. **RPN = 45**: below the threshold, risk accepted and recorded.
- **Line 3 — S 6**: a wrong setpoint compromises the room's N+1 redundancy. **O 3**: isolated. **D 6**: "detection depends on an instrument or a specific test" — there is no control today ("None"), only calibration would prove it. **RPN = 108**: crosses the threshold **without ever having failed** — that is the merit of the FMEA: line 3 gets an action before it becomes an item.
- Lines 1 and 3 turn **red** and get a **Recommended action**, an **Owner** and a **Due** date (line 1: load and check the parameter list before the test; line 3: calibrate the sensor before L3). Line 2 stays as it is.

> **Tip.** Write the **failure mode** as what is observed on the equipment ("Reading out of tolerance"), the **cause** as what produces it ("Sensor not calibrated") and the **effect** as what the client feels ("Wrong setpoint; room out of range"). Mixing the three is the most common mistake and unbalances the scores.

12.3 The action threshold

The **Action threshold (RPN)** appears in the analysis header (default **100**). A line with an RPN **equal to or above** it gets its background and number in **red**, and the caption below the table repeats the rule: **Highlighted line: RPN at or above 100 requires action. RPN = S × O × D (1 to 10 each).**

- The mark is stored with the line: in the project **detailed PDF** and in the **NCR** form the line is printed with "S · O · D · RPN" and the suffix **(priority)**; the re-evaluation is printed as **Re-evaluation S · O · D · RPN**.
- The threshold also judges the re-evaluation: the **RPN′** shows in **red** if it is still at or above the threshold and in **green** if it dropped below.
- The value is a company setting (`fmea_rpn_threshold`) with no screen: ask support to change it. 100 is the classic value; companies working with harsher scales use 80 or 120.

> **Warning.** H2O highlights by RPN, but **the RPN is not the only criterion**: a line with **Severity 9 or 10** (safety, life, legal compliance) deserves an action even with low O and D — RPN 9 × 2 × 3 = 54 does not make it acceptable. It is a rule of practice, not of the system: agree on it in the Quality procedure and apply it in the meeting.

12.4 Re-evaluating after the action

The recommended action only counts once it is proven to have reduced the risk. After the due date, the same line gets the **S′**, **O′** and **D′** scores (**Re-evaluation after the action**) and the **Done** mark; the **RPN′** is computed on the spot. Usually **S′ = S** (the gravity of the effect does not change with a process action), **Occurrence drops** when the cause was eliminated and **Detection improves** when the action added a control. If the analysis was already concluded, **Reopen**, fill in, mark **Done** and **Conclude analysis** again.

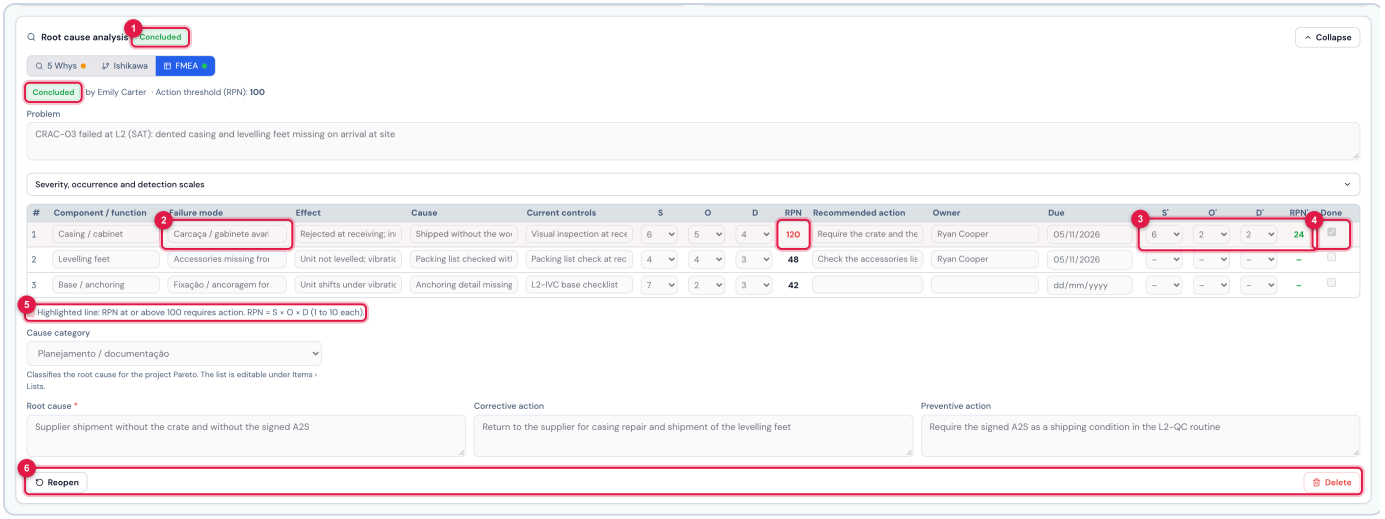


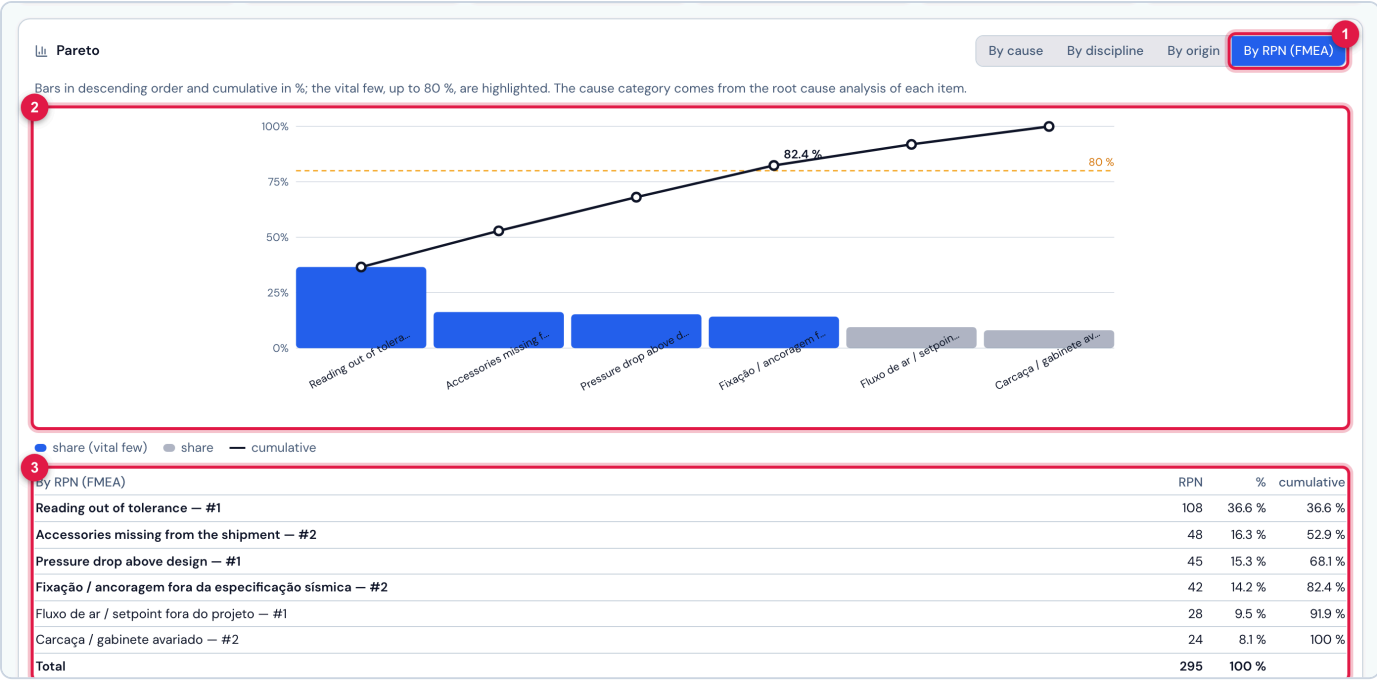
Figure 28. The **concluded** FMEA of the item from the CRAC-03 failure at L2: the first line crossed the threshold, got an action, was re-evaluated and marked **Done**; the other two stayed below the threshold.

1. The **Concluded** badge on the block title and on the analysis header (green dot on the FMEA method).
2. The priority line: **Carcaça / gabinete avariado** (casing / cabinet damaged), S 6 × O 5 × D 4 = **RPN 120**, in red.
3. The re-evaluation **S′ O′ D′** = 6, 2 and 2 → **RPN′ 24**, in green: Severity stayed, Occurrence and Detection dropped with the crate and the loading photo now required in the A2S.
4. **Done**: the recommended action was carried out on time.
5. The threshold caption, with the company value.
6. Concluded, the analysis shows only **Reopen** and **Delete**; every field is locked.

- **Conclude analysis** requires the **Root cause** written (**Fill in the root cause before concluding.**) and **at least one line with the three scores** — which is what gives an RPN above zero (**Register at least one failure mode before concluding.**). Lines without failure mode, effect, component and scores are discarded on save.
- The **RPN′** is only computed with the **three** new scores; two of them leave the column as **–**. **Done** without a re-evaluation is allowed, but proves nothing: do both together.
- Reopening to re-evaluate **does not erase** who concluded the first time: the item history keeps both conclusions.
- Conclude the FMEA **before** the re-evaluation, not after: the commissioning failure item needs a concluded analysis to be completed (chapter 8), and the re-evaluation usually comes weeks later.

12.5 The project Pareto by RPN

On the items screen, with a project selected, the **Pareto** card has the dimension **By RPN (FMEA)**: instead of counting items, it adds up the **RPN** of each line of the project's FMEAs. Each bar is **one failure mode of one item** ("mode — #number"), and its height is the line's RPN — or the **RPN′**, if it has already been re-evaluated. It is the priority list of the whole project, ordered by risk, and it shows at once what the re-evaluation took off the top.



By RPN (FMEA)	RPN	%	cumulative
Reading out of tolerance — #1	108	36.6 %	36.6 %
Accessories missing from the shipment — #2	48	16.3 %	52.9 %
Pressure drop above design — #1	45	15.3 %	68.1 %
Fixação / ancoragem fora da especificação sísmica — #2	42	14.2 %	82.4 %
Fluxo de ar / setpoint fora do projeto — #1	28	9.5 %	91.9 %
Carcaça / gabinete avariado — #2	24	8.1 %	100 %
Total	**295**	**100 %**	

Figure 29. The **Pareto** of the commissioning project in the **By RPN (FMEA)** dimension: the FMEA lines of the CRAC-02 and the CRAC-03, ordered by RPN.

1. The **By RPN (FMEA)** dimension.
2. One bar per failure mode and item, in descending order of RPN: the CRAC-02 supply air sensor enters with **108** and the re-evaluated CRAC-03 line with **24**, not 120. The bar height is the RPN's share of the total; the line is the cumulative %.
3. The table: the **RPN** column in place of the count, the share and the cumulative.

- Lines with an RPN above zero from **all** FMEA analyses of the project items are included, **in progress or concluded**; deleted analyses are not.
- The list's **open only** chip applies here too: on, only the FMEAs of open items; off, those of every item of the project.
- Lines with the same failure mode on different items are different bars (the label carries the item number): the Pareto by RPN answers "which line to treat first", not "which mode repeats" — for that, use **By cause** with the cause category.

12.6 The company lists

The scales and the catalog are lists under **Items › Lists** (chapter 10; the screens are in figures 25 and 26 of chapter 11). H2O seeds the defaults once per company; from then on, what Quality edits is what the FMEA shows.

- **Severity (FMEA)**, **Occurrence (FMEA)** and **Detection (FMEA)**: one row per score; the **name starts with the score** ("7 — Alta") and the **description is the criterion** of the panel. Renaming the label and rewriting the criterion is free; **keep the score at the start of the name**, because that is what enters the RPN. Deactivating a score removes it from the selector (old analyses keep the score).
- **Failure modes (FMEA)**: the catalog suggested while typing in the **Failure mode** column; the **description is the group**. The field accepts free text — "Accessories missing from the shipment" on the CRAC-03 is not in the catalog — and free text does **not** enter the catalog by itself: add it to the list if it is going to repeat.

- With no scale registered (whole list deactivated), the selector offers **1 to 10** without criteria and the panel warns **No scale registered: use 1 to 10.**

The default catalog, by group (names as registered, in Portuguese, with a translation for reading):

Group	Failure modes
Elétrica (electrical)	Conexão elétrica frouxa / sem torque (loose / untorqued connection) · Sequência de fases invertida (reversed phase sequence) · Isolamento abaixo do mínimo (insulation below minimum) · Proteção / disjuntor mal ajustado (protection / breaker misadjusted) · Aterramento / equipotencialização ausente (earthing / bonding missing) · UPS não transfere / bateria fora de spec (UPS does not transfer / battery out of spec) · Gerador não parte / não assume carga (generator does not start / take load)
Climatização (cooling)	Vazamento de fluido refrigerante (refrigerant leak) · Fluxo de ar / setpoint fora do projeto (airflow / setpoint off design) · Condensadora obstruída / sem limpeza (condenser blocked / not cleaned)
Incêndio (fire)	Detector / laço de incêndio sem resposta (detector / fire loop not responding)
Mecânica (mechanical)	Fixação / ancoragem fora da especificação sísmica (fixing / anchoring outside seismic spec) · Carcaça / gabinete avariado (casing / cabinet damaged)
Documentação (documentation)	TAG / identificação ausente ou errada (TAG / identification missing or wrong)
Segurança eletrônica (electronic security)	Controle de acesso / câmera sem comunicação (access control / camera without communication)

> **Warning.** Like disciplines and origins, these lists are **a company catalog, in Portuguese only**: on the English and Spanish screens the scores, criteria and failure modes appear as registered. A company operating in another language rewrites the lists in that language.

12.7 Script for an FMEA meeting

A useful FMEA is done as a group, in a 45- to 90-minute session per equipment, with the screen projected. The script below follows the order of the columns.

1. **Before**: call in those who know the equipment — engineering, commissioning, supplier, operations — and check under **Items › Lists** that the scales and the catalog say what your company means.
2. Open the item, the **Root cause analysis** block, the **FMEA** method and **Start analysis**. Rewrite the **Problem** as an observable fact (the item title comes pre-filled).
3. Open **Severity, occurrence and detection scales** and keep the panel open.
4. List the **failure modes**, one per line, starting from the catalog and asking "what else could this test have let through?"; fill in **Component / function**.
5. For each line, write **Effect**, **Cause** and **Current controls** — what today would prevent or detect the failure. Only then score.
6. Give **S** from the effect, **O** from the cause and **D** from the controls, reading the criterion; discuss until consensus and do not average. The **RPN** appears on its own.
7. For the lines in **red**, write the **Recommended action**, the **Owner** and the **Due** date; for the others, decide as a group whether the risk is accepted (and leave the line as a record).
8. Pick the **Cause category**, write the **Root cause**, the **Corrective action** and the **Preventive action**; **Save** and **Conclude analysis**.
9. After the due date: **Reopen**, give **S′ O′ D′**, mark **Done** and **Conclude analysis** again.

10. On the project screen, follow **Pareto › By RPN (FMEA)**: what stayed at the top is the agenda of the next meeting.

> **Tip.** Half an hour of meeting yields more than a perfect analysis done alone: the Detection score almost always changes when whoever operates the equipment is in the room.

13. Frequently asked questions and messages

The table explains the messages that can appear in the punch list. The most common questions come right after.

Message	Where	Why	What to do
Choose the project / **Enter the item title**	**New item**	required field empty	fill in the project and the title
Project not found or outside your scope	**New item**, PDF	the project belongs to a site you cannot see	choose another project, or ask for access to the site (manual Companies and hierarchy, chapter 2)
N photos failed / **Failed to upload N photos**	recording / **Attach**	the upload of some photo failed (network, large file)	attach it again on the item page
Attach the closing photo (evidence of the fix) before requesting validation.	**Request validation**	there is no closing photo	**Attach** in the **Closing photo** panel (chapter 6)
Enter the rejection comment (what is still missing).	**Reject**	empty comment	write the assessment
Enter the block reason (material, third parties, clearance…).	**Block**	empty comment	write the reason
Enter the justification (management decision / accepted risk / false positive).	**Won't fix**	empty comment	write the justification
Enter the reason for reopening.	**Reopen**	empty comment	write the reason
Transition not allowed from "…" to "…" (or no permission).	flow buttons	someone else changed the status while your screen was open, or the right changed	reload the page
Only Quality (validate right) can complete a punch item under validation. (and the ones for **Won't fix** and **Reopen**)	Quality buttons	**Validate (Quality)** is missing	ask for the right (chapter 2)
Punch item completed or no permission to edit	**Save** of the edit	the item was closed, or you have neither **Edit** nor are the responsible	ask Quality to reopen it
Punch item not found	item page and buttons	the item was deleted or belongs to a site outside your scope	go back to the list
This punch item already has a work order	**Open work order**	someone already opened the work order	reload: the number shows in **Links**
This item was already escalated (RNC-…)	**Escalate to NCR**	the NCR already exists	open the NCR through the code in **Links**

Message	Where	Why	What to do
A punch item with an NCR cannot be deleted.	trash icon	the item was escalated	keep it; close it through the flow
You requested the validation of this punch item — another person with Validate (Quality) approves or rejects it.	**Validate and complete** / **Reject**	you were the one who took the item to **Under validation**	ask another person with **Validate (Quality)**
A punch item with an NCR cannot be permanently deleted.	**Trash** › **Delete permanently**	the item was escalated	leave it in the trash, or restore it
Punch item is not in the trash	**Trash**	someone else already restored or permanently deleted it	reload the page
Only users with Trash on Punch list can delete a photo, and only while the item is open.	trash icon of the photo	**Trash** is missing, or the item is already closed	ask for the right; on a closed item, Quality reopens it first
Photo or attachment not found on this item	trash icon of the photo	someone else already deleted the file	reload the page
Item in use on punch items — deactivate it instead of deleting.	**Lists**	some item uses the entry	**deactivate**
An item with this name already exists	**Lists**	repeated name in the same list	use another name, or reactivate the old one
Failed to generate the PDF	**Pending** / **Complete**	server failure	try again; on a very large project, try **List** or **Photos: No**
No project has items yet…	main screen	no item on the sites you can see	**New item**
No items for this filter.	list	the filter found nothing (the list opens on **Open**)	click the **Total** card or change the filter

13.1 Frequently asked questions

- **I cannot find the Punch list (GQE) menu.** It is under **Operations** and only shows with **Read** in the **Punch list (GQE)** row of the profile (chapter 2).
- **Can I record an item in the app?** No: punch list items are handled on the web (on a phone, through the browser). In the app, what opens an item is the failure of a commissioning test (chapter 8).
- **The Request validation button does not work.** Attach the closing photo first — without it, validation is not requested (chapter 6).
- **I do not see Validate and complete.** It only shows with **Validate (Quality)** in the profile, with the item **Under validation** and if you were not the one who requested the validation (chapter 6).
- **Is the responsible notified of the item?** Yes, in the bell and by e-mail: when assigned, when the work order is opened, when the validation is rejected and when the item is completed. Quality is notified when an item arrives for validation (chapter 6).
- **I solved the work order: is the item closed?** No. The work order and the item are independent; the item is only completed by Quality, with the closing photo.
- **I cancelled the work order and cannot open another.** That is the rule: the item has only one work order and stays linked to it even when cancelled; **Open work order** does not come back (chapter 7).
- **How do I record what the client pointed out at the inspection? Type** = **Client punch list**. It gets the badge and can be filtered; give the client's profile **Read** and **Create** if they will record it themselves (chapter 2).
- **The completed item is wrong.** Quality uses **Reopen** with the reason; it goes back to **Triage / Under review** and can be edited.
- **I recorded it on the wrong project.** The project cannot be changed: move it to the trash (**Trash** right) and record it again on the right project.
- **I deleted an item by mistake. Trash** button at the top of the screen › **Restore** — it comes back with the status it had (chapter 5).
- **I attached the wrong photo.** Whoever has **Trash** deletes it with the trash icon in the corner of the photo, while the item is still open (chapter 5). Without that right, attach the right one and say in the comment of the next step which one counts; Quality checks before validating.
- **I failed a test and no item was opened.** It only opens when the test ticket is linked to a commissioning phase and the result is **Failed** (not **Retest**). If there was already an open item for the same task, no other is created (chapter 8).
- **The PDF did not respect my filter.** The **Project PDF**, on the item page, takes the whole project. For a filtered PDF, set the filter in the list and use the **PDF** button on the project row (chapter 9).
- **The spreadsheet came with only the open items.** It follows the list filter, which opens on **Open**. Click the **Project total** card first (chapter 9).