AXOSFER

SAMPLE – fictional site data

EXPLOSION PROTECTION DOCUMENT

Turkish Regulation on the Protection of Workers from the Hazards of Explosive Atmospheres (Official Gazette 30.04.2013/28633), Article 10 · transposes Directive 1999/92/EC

EPD-SAMPLE-07 · Rev. 0

Sample Fuel Station (fictional)

Sample District, Ring Road No. 1, Türkiye (fictional)

Pump islands (3 islands, petrol and diesel), underground fuel tanks, fill points, tank manholes and vent pipes; distances of nearby facilities (shop, electric vehicle charger, car wash, generator, drains) to the zones. English excerpt of a sample study; the site and all data are fictional.

SCOPE

2 areas · 8 sources of release · 7 Ex equipment items

ZONES IDENTIFIED

Zone 0 · Zone 1 · Zone 2

EQUIPMENT REQUIREMENT

gas/vapour: IIA T3

METHOD

IEC 60079-10-1:2020; EN 1127-1:2019; Turkish Regulation, Annexes 1–4

axosfer SAMPLE

Document no.	Revision / date	Prepared by	Approved by
EPD-SAMPLE-07	**Rev. 0 · 13.10.2026**	**O. Ferhat Anac – Axosfer**	**Employer's representative**

Contents

About this excerpt 3

Executive summary 4

Actions in order of priority . . . 5

Interim measures from today . . . 5

5 Hazardous area classification (excerpt) 6

5.3 Zones and equipment requirement . . . 6

5.4 Conditions of validity . . . 6

6 Detailed assessment of the areas (excerpt: area A-1) 8

6.1 A-1 – Pump islands . . . 8

13 Action plan 17

13.1 Actions . . . 17

13.2 Interim measures until the actions are completed . . . 17

14 Conclusions and recommendations 18

14.1 Conclusion . . . 18

14.2 Assumptions, expert decisions and limitations . . . 18

Annex A Hazardous area drawings 21

Basis of this document and signature 23

axosfer
SAMPLE

About this excerpt

This document is an English excerpt of a sample explosion protection document prepared with our method for a fictional fuel station in Türkiye. The full document is written in Turkish and has 93 pages: 15 sections and 9 annexes. This excerpt shows how the document is structured and how deep it goes:

- Executive summary (complete)
- Sections 5.3 and 5.4: zones, equipment requirements and conditions of validity (complete)
- Section 6.1: the complete assessment of one area, A-1 pump islands, with two calculation sheets
- Section 13: action plan and interim measures (complete)
- Section 14: conclusions and the assumptions register (complete)
- Annex A: the hazardous area drawings of both areas

Section and table numbers are those of the original. The site and all data are fictional. Like every document we issue, this excerpt carries a QR code on every page. Scan it to open the verification page: it shows the record of the document, and if you drop this PDF there, it confirms that the file has not been changed.

> Values marked [to be checked against the standard] rest on a standard whose full text was not available for this sample study. They are listed as a limitation in the assumptions register (Section 14.2, V-11).

axosfer
SAMPLE

Executive summary

This explosion protection document for Sample Fuel Station (fictional) covers 2 areas and 8 sources of release (site visit: 09.10.2026). The hazardous area classification was calculated with the method of IEC 60079-10-1:2020, and every calculation was cross-checked with an independent method (Annex C). Result: A-1 Pump islands – Zone 1 (around K-1, r = 1.5 m), Zone 1 (around K-2), Zone 2 (around K-3, r = 2.0 m); A-2 Tank area, fill points and vent pipes – Zone 0 (around K-5), Zone 1 (around K-6), Zone 2 (around K-8, r = 5.0 m), Zone 1 (around K-9, r = 2.5 m). Two further points were assessed and, with the reasons stated, not counted as sources of release.

Table S.2 – Key indicators

The results of the document in one table: scope, the protection the equipment must provide, the status of equipment and ignition sources, risk and open actions. Each row is detailed in the relevant section.

Indicator	Status
Areas / sources of release	2 areas · 10 sources (2 of them, with reasons, not a source)
Chemical screening	2 substances: 1 forms an explosive atmosphere, 1 only under certain conditions (Sections 4.2–4.3)
Workers and tasks	7 roles (4 contractors); 7 tasks defined in hazardous areas, 3 of them under a permit
Zone requirement	gas/vapour: IIA T3
Ex equipment	7 items: 4 suitable, 0 unsuitable, 0 information missing, 3 outside the zones
Ignition sources	26 assessments: 16 present, 10 absent, 0 to be assessed
Explosion risk (current → after measures)	Medium: 3, Low: 10 → Medium: 2, Low: 11
Open actions	3 (urgent: 0, high: 2)
Conditions of validity	10 conditions (if one fails, zones grow; each is tied to the inspection plan)
Self-check	15 / 15 items complete

axosfer
SAMPLE

Actions in order of priority

Table S.3 – Priority actions

Open actions by priority (urgent → high → medium → low): who does what, by when. Area: the area code of the action (general: the whole site). The full list is in Section 13.

No.	Action	Area	Priority	Responsible	Due
AK-1	The electric vehicle charger is inside the calculated zone (dispenser: 5 m ≤ 5.5 m → Zone 1 (K-1)). Document that the unit is suitable (Ex) for the zone, or move it outside the zone.	A-1	high	Site operator	31.12.2026
AK-2	A drain, manhole, grating or basement entrance is inside the calculated zone (fill point: 4 m ≤ 5 m → Zone 2 (K-8)); heavy vapour can enter it. Close it, or prevent vapour ingress with a sealed cover and a trap; if it stays open, classify its interior as Zone 1 and select the equipment accordingly.	A-1	high	Site operator	31.12.2026
AK-3	Verification of the explosion protection measures before putting into operation (Annex 2, 2.8)	general	medium	Competent person	31.12.2026

Interim measures from today

Until the actions are due, the following interim measures apply from today; each is lifted when its action is completed (Section 13.2).

- AK-1 (due 31.12.2026): If fuel is spilled near the unit, its power is switched off and not restored until the spill is cleaned up.
- AK-2 (due 31.12.2026): If fuel is spilled, its flow into pits and drains is stopped at once with absorbent material.

The assumptions, the expert decisions that differ from the calculation and the limitations behind these results are listed in Section 14.2, each with how it is verified or monitored.

axosfer
SAMPLE

5 Hazardous area classification (excerpt)

5.3 Zones and equipment requirement

Table 5.3 – Zones and equipment requirement

The zones in each area, their location and extent, and the minimum category, EPL, group and temperature class that the equipment in them must meet. Used directly for purchasing and for Ex inspections.

Area	Name	Zone	Location and extent	Equipment requirement
A-1	Pump islands	Zone 1	around K-1, r = 1.5 m	category 2G (EPL Gb) or higher · IIA · T3
A-1	Pump islands	Zone 1	around K-2	category 2G (EPL Gb) or higher · IIA · T3
A-1	Pump islands	Zone 2	around K-3, r = 2.0 m	category 3G (EPL Gc) or higher · IIA · T3
A-2	Tank area, fill points and vent pipes	Zone 0	around K-5	category 1G (EPL Ga) or higher · IIA · T3
A-2	Tank area, fill points and vent pipes	Zone 1	around K-6	category 2G (EPL Gb) or higher · IIA · T3
A-2	Tank area, fill points and vent pipes	Zone 2	around K-8, r = 5.0 m	category 3G (EPL Gc) or higher · IIA · T3
A-2	Tank area, fill points and vent pipes	Zone 1	around K-9, r = 2.5 m	category 2G (EPL Gb) or higher · IIA · T3

5.4 Conditions of validity

The classification is valid as long as the following conditions are met. Each condition is monitored by a check in the inspection plan (Section 12); if a condition fails, the zones grow and this document is revised.

Table 5.4 – Conditions of validity

The assumptions on which the classification rests. If a condition fails, the zone grows or changes; each condition is therefore tracked in the inspection plan.

No.	Condition	If it fails	Check
G-1	The vehicle engine is switched off during refuelling; smoking and naked flames are prohibited (A-1)	An effective ignition source is present inside the zone	Supervision of refuelling and warning signs
G-2	The automatic shut-off of the nozzles, the breakaway couplings and the shear valves under the dispensers work (A-1)	Overfill or hose rupture releases more fuel; the zone grows	Function check
G-3	Spills at the islands are cleaned up at once; absorbent material is ready (A-1)	The spill spreads and gives off vapour for a long time	Absorbent material and spill records
G-4	There is no open drain, manhole, grating or pit inside the calculated zone (A-1)	Heavy vapour accumulates; the pit becomes Zone 1 and the drain carries vapour further away	Site round
G-5	No equipment is added to the dispensers without the manufacturer's approval (payment terminal, screen, cable entry) (A-1)	The certified zone separation of the dispenser is lost	Change records and service reports

No.	Condition	If it fails	Check
G-6	Tanker unloading follows the instruction and is supervised: earthing, wheel chocks, check of the correct tank and of the free volume, tight connections (A-2)	Static spark, overfill or unloading into the wrong tank; spill and zone grow	Unloading instruction and unloading records
G-7	Fill point and manhole covers are closed and sealed; manholes are dry and clean (A-2)	Fuel and vapour accumulate in the pit and escape from the manhole	Round of manholes and fill points
G-8	Vent pipe outlets are open and undamaged; the flame arrester or pressure-vacuum valve is in place and clean (A-2)	The tank stays under pressure, or vapour escapes at an unexpected point	Vent outlet check
G-9	Tank level gauging and overfill prevention work (A-2)	The tank overfills; large spill	Function check of the level gauging system
G-10	Petrol is never unloaded into a diesel tank; products are not mixed (A-2)	The 'not a source' decision for diesel no longer holds	Fill point labels and product check before unloading

axosfer
SAMPLE

6 Detailed assessment of the areas (excerpt: area A-1)

6.1 A-1 – Pump islands

6.1.1 Description of the area

Pump islands: 3 islands, 3 dispensers; 6 petrol nozzles and 6 diesel nozzles. Vehicles are refuelled in this area.

Table 6.1 – Properties of the area – A-1 Pump islands

Type, dimensions and ventilation of the area; inputs to the ventilation and background concentration calculation. f: ventilation efficiency factor (1 ideal mixing … 5 impeded flow).

Property	Value
Type	open air
Dimensions L × W × H	34.0 × 24.0 × – m
Floor area / volume	816.0 m² / – m³
Ventilation	open air
Availability / f	good / 2.0
Note	Wind speed: vapour heavier than air, at most 2 m above ground, unobstructed area → 0.3 m/s (IEC 60079-10-1 Table C.1). Petrol vapour and LPG are heavier than air: they settle and accumulate in pits, drains, manholes and basement entrances.

6.1.2 Ventilation

Open air: dilution is provided by the wind. A conservative wind speed of u = 0.30 m/s is used, assumed to be present around the source even in still air (IEC 60079-10-1 Annex C). Obstacles and congested spaces are taken into account with the factor f (2.0).

6.1.3 Sources of release and calculation

Table 6.2 – Sources of release – A-1 Pump islands

The sources of release in this area and the reasons for their grade. Continuous: continuously or for long periods; primary: occasionally in normal operation; secondary: only in abnormal operation and for short periods.

No.	Source	Substance	Grade	Reason for the grade
K-1	Vehicle tank filler neck (around the petrol nozzle) – 6 units	Petrol (unleaded)	primary	At every refuelling, the vapour in the vehicle tank is pushed out around the nozzle (displaced vapour, conservatively taken as saturated). The zone extent is governed by the flow rate during refuelling: 40 L/min nozzle flow (dispenser label). The vapour flows down from the filler neck and spreads on the ground: heavy gas curve; the zone is taken up to 1 m above ground.

axosfer SAMPLE

No.	Source	Substance	Grade	Reason for the grade
K-2	Inside of the petrol dispenser housing (hydraulic section: pump, meter, air separator, connections) and the connection pit below – 3 units	Petrol (unleaded)	secondary	No leakage in normal operation; leaks occur when a gasket, fitting or packing fails. The air separator releases a small amount of vapour while it runs.
K-3	Small spill on the island floor (overfill, nozzle drip, hose leak)	Petrol (unleaded)	secondary	Not expected in normal operation: overfill if the automatic shut-off fails, nozzle drip or hose leak. A spill of 5 L is assumed; it spreads to 1 cm depth (EPA) → 0.5 m². Larger spills (hose rupture, collision with a dispenser) are limited by the breakaway coupling and the shear valve and are covered by the emergency plan.
K-4	Diesel nozzles, dispensers and lines – 6 units	Diesel fuel	not a source	Flash point of diesel 55 °C; highest product and ambient temperature 35 °C; margin 20 °C ≥ 10 °C → no explosive vapour in normal operation. This does not hold if petrol is mixed into the diesel or if fuel is sprayed onto a hot surface. [to be checked against the standard]

Calculation sheet K-1 – Vehicle tank filler neck (around the petrol nozzle)

The vehicle tank filler neck is a primary grade source of release (Table 6.2). The calculation assumes that at every refuelling a volume of saturated vapour equal to the volume dispensed is pushed out (40 L, 60 times per hour). This gives a release rate W = 1.057 g/s and a characteristic release rate $Q_c = 2.75 \cdot 10^{-2}$ m³/s. In open air the wind provides dilution; a conservative wind speed of 0.30 m/s is used. The air velocity u = 0.300 m/s is below the high-dilution limit $13.4 \cdot Q_c = 0.369$ m/s; the degree of dilution is medium and the availability of ventilation good. IEC 60079-10-1 Table D.1 gives Zone 1. The zone extent read from the heavy gas curve of Figure D.1 is r ≈ 1.48 m; 1.5 m is used in the drawing.

Table 6.3 – Calculation inputs – K-1

All input values, their units and where they come from. The effect of uncertain inputs on the result is shown in the sensitivity table of Annex C.

Symbol	Input	Value	Unit	Source
M	Molar mass (petrol, unleaded)	66.00	kg/kmol	substance card (Section 4.5)
LFL	Lower flammable limit	1.40	% vol	substance card (Section 4.5)
V	Volume dispensed	40	L	site data
n	Refuellings per hour	60	1/h	site data
p_v	Vapour pressure (design value)	58,565	Pa	substance card (Section 4.5)
u_w	Wind speed (conservative)	0.30	m/s	IEC 60079-10-1 Annex C / expert
Availability	Availability of ventilation	good	–	expert

SAMPLE

Table 6.4 – Step-by-step calculation – K-1

Each step with its formula, the numbers substituted and the result. The calculation can be repeated by hand or with other software.

Step	Calculation
Gas/vapour density ρ_g	$\rho_g = \frac{p_a M}{R T} = \frac{101\,325 \times 66.00}{8\,314 \times 293.15} = 2.744\ \mathrm{kg/m^3}$
Displaced vapour W	$W = \frac{n}{3600} V \frac{p_v}{p_a} \rho_g = \frac{60}{3600} \times 0.040 \times \frac{58\,565}{101\,325} \times 2.744 = 1.057 \cdot 10^{-3}\ \mathrm{kg/s}$
Volumetric flow Q_g	$Q_g = \frac{W}{\rho_g} = \frac{1.057 \cdot 10^{-3}}{2.744} = 3.853 \cdot 10^{-4}\ \mathrm{m^3/s}$
Characteristic release rate Q_c	$Q_c = \frac{W}{\rho_g \cdot \mathrm{LFL}} = \frac{1.057 \cdot 10^{-3}}{2.744 \times 0.0140} = 2.752 \cdot 10^{-2}\ \mathrm{m^3/s}$
Air velocity u	$u = u_w = 0.30\ \mathrm{m/s}$
Degree of dilution	$u = 0.3000\ \mathrm{m/s} \le 13.4\,Q_c = 0.3688\ \mathrm{m/s} \Rightarrow \mathrm{medium}$
Zone type	IEC 60079-10-1 Table D.1: primary grade · medium dilution · good availability → Zone 1
Zone extent r	$r = a\,Q_c^{\,b} = 9.03 \times (2.752 \cdot 10^{-2})^{0.504} = 1.48\ \mathrm{m} \rightarrow r_{\mathrm{drawing}} = 1.5\ \mathrm{m}$
Decision	calculation → Zone 1, r = 1.5 m

Result K-1: Zone 1, r = 1.5 m

Cross-check and sensitivity: the decision is robust; the zone type does not change in either of the two scenarios tested (Annex C).

K-2 – Inside of the petrol dispenser housing and the connection pit below: no release rate is calculated; the zone is set by a reasoned expert decision (6.1.4).

Calculation sheet K-3 – Small spill on the island floor (overfill, nozzle drip, hose leak)

The small spill on the island floor is a secondary grade source of release (Table 6.2). The calculation assumes evaporation from a liquid surface of 0.50 m². This gives a release rate W = 1.169 g/s and a characteristic release rate Q_c = 3.04·10^{-2} m³/s. In open air the wind provides dilution; a conservative wind speed of 0.30 m/s is used. The air velocity u = 0.300 m/s is below the high-dilution limit 13.4 · Q_c = 0.408 m/s; the degree of dilution is medium and the availability of ventilation good. IEC 60079-10-1 Table D.1 gives Zone 2. The zone extent read from the heavy gas curve of Figure D.1 is r ≈ 1.55 m; 2.0 m is used in the drawing.

axosfer SAMPLE

Table 6.5 – Calculation inputs – K-3

All input values, their units and where they come from. The effect of uncertain inputs on the result is shown in the sensitivity table of Annex C.

Symbol	Input	Value	Unit	Source
M	Molar mass (petrol, unleaded)	66.00	kg/kmol	substance card (Section 4.5)
LFL	Lower flammable limit	1.40	% vol	substance card (Section 4.5)
A	Pool area	0.50	m²	expert
u	Air velocity over the pool	0.25	m/s	conservative
p_v	Vapour pressure (design value)	58,565	Pa	substance card (Section 4.5)
u_w	Wind speed (conservative)	0.30	m/s	IEC 60079-10-1 Annex C / expert
Availability	Availability of ventilation	good	–	expert

Table 6.6 – Step-by-step calculation – K-3

Each step with its formula, the numbers substituted and the result. The calculation can be repeated by hand or with other software.

Step	Calculation
Gas/vapour density ρ_g	$\rho_g = \frac{p_a M}{RT} = \frac{101\,325 \times 66.00}{8\,314 \times 293.15} = 2.744\ \mathrm{kg/m^3}$
Evaporation W	$W = 2.1127 \cdot 10^{-6} \frac{u^{0.78} M^{2/3} A p_v}{T}$ $= 2.1127 \cdot 10^{-6} \times \frac{0.25^{0.78} \times 66.00^{2/3} \times 0.50 \times 58\,565}{293.15}$ $= 1.169 \cdot 10^{-3}\ \mathrm{kg/s}$
Volumetric flow Q_g	$Q_g = \frac{W}{\rho_g} = \frac{1.169 \cdot 10^{-3}}{2.744} = 4.260 \cdot 10^{-4}\ \mathrm{m^3/s}$
Characteristic release rate Q_c	$Q_c = \frac{W}{\rho_g \cdot \mathrm{LFL}} = \frac{1.169 \cdot 10^{-3}}{2.744 \times 0.0140} = 3.043 \cdot 10^{-2}\ \mathrm{m^3/s}$
Air velocity u	$u = u_w = 0.30\ \mathrm{m/s}$
Degree of dilution	$u = 0.3000\ \mathrm{m/s} \ \leq \ 13.4\,Q_c = 0.4078\ \mathrm{m/s} \ \Rightarrow \ \mathrm{medium}$
Zone type	IEC 60079-10-1 Table D.1: secondary grade · medium dilution · good availability → Zone 2
Zone extent r	$r = a\,Q_c^{\,b} = 9.03 \times (3.043 \cdot 10^{-2})^{0.504} = 1.55\ \mathrm{m} \ \rightarrow \ r_{\mathrm{drawing}} = 2.0\ \mathrm{m}$
Decision	calculation → Zone 2, r = 2.0 m

Result K-3: Zone 2, r = 2.0 m

Cross-check and sensitivity: the decision is robust; the zone type does not change in either of the two scenarios tested (Annex C).

axosfer SAMPLE

K-4 – Diesel nozzles, dispensers and lines: not counted as a source of release. Reason: Flash point of diesel 55 °C; highest product and ambient temperature 35 °C; margin 20 °C ≥ 10 °C → no explosive vapour in normal operation. This does not hold if petrol is mixed into the diesel or if fuel is sprayed onto a hot surface. [to be checked against the standard]

6.1.4 Hazardous area classification

Table 6.7 – Classification result – A-1 Pump islands

The zone and extent set for each source, and the basis of the decision: calculation or a written expert decision.

No.	Zone and extent	Basis
K-1	Zone 1, r = 1.5 m	Calculation (6.1.3)
K-2	Zone 1	The inside of the housing and the pit below are narrow spaces with little air movement (low dilution). Table D.1: secondary grade + low dilution → Zone 1. The dispenser, with these internal spaces, is a certified unit; the internal zones and the separation of the electronic head are taken from the manufacturer's zone drawing to EN 13617-1. [to be checked against the standard]
K-3	Zone 2, r = 2.0 m	Calculation (6.1.3)
K-4	not a source	Flash point 55 °C, 20 °C above the highest temperature (Table 6.2).

Fuel station module: petrol data, refuelling and the distance of nearby facilities to the zones

Table 6.8 – Module calculation – A-1 Pump islands

Area-specific values of the fuel station module: inputs, intermediate values and whether each criterion is met. The zone calculation itself is in the calculation sheets; this table justifies the values used there.

Quantity / criterion	Value	Result
Petrol vapour pressure (design value)	summer: DVPE 60 kPa, 35 °C → 58.6 kPa; winter: DVPE 90 kPa, 20 °C → 55.7 kPa	58.6 kPa (the larger)
Vapour released during refuelling	40 L/min → 1.06 g/s (1.59 g per litre dispensed)	input to 6.1.3
Effective distance from the dispenser – Zone 1 (K-1)	hose 4 m + zone radius 1.5 m	5.5 m
Effective distance from the dispenser – Zone 2 (K-3)	hose 4 m + zone radius 2 m	6 m
Shop / office door or window	dispenser: 10 m > 6 m; fill point: 24 m > 5 m; vent pipe: 12 m > 2.5 m	outside the zones
Electric vehicle charger	dispenser: 5 m ≤ 5.5 m → Zone 1 (K-1); fill point: 20 m > 5 m; vent pipe: 16 m > 2.5 m	INSIDE A ZONE – ASSESSED
Car wash	dispenser: 18 m > 6 m; fill point: 14 m > 5 m; vent pipe: 15 m > 2.5 m	outside the zones
Generator / compressor	dispenser: 20 m > 6 m; fill point: 25 m > 5 m; vent pipe: 8 m > 2.5 m	outside the zones
Drain, manhole, grating or basement entrance	fill point: 4 m ≤ 5 m → Zone 2 (K-8); dispenser: 7 m > 6 m; vent pipe: 9 m > 2.5 m	INSIDE A ZONE – ASSESSED
Neighbouring building or road	dispenser: 22 m > 6 m; fill point: 15 m > 5 m; vent pipe: 6 m > 2.5 m	outside the zones

SAMPLE

Zone extents are calculated source by source with IEC 60079-10-1. They are to be compared with TS 12820, the Turkish standard for fuel stations, and with the dispenser manufacturer's zone drawing to EN 13617-1; any difference is written down with the reason for the decision. [to be checked against the standard]

Distances of nearby facilities are measured horizontally. Any point the nozzle hose can reach may be a vehicle filler neck, so the hose length is added to the zone radius. Every facility inside a zone is in the action plan.

The hazardous area drawing of this area, with plan and section, is in Annex A/1.

6.1.5 Ignition sources

Table 6.9 – Ignition source assessment – A-1 Pump islands

The types of ignition source present in this area and how they are controlled. All 13 types of EN 1127-1 are in the matrix of Section 7.

Type (EN 1127-1)	Status	Where?	Measure
Hot surfaces	present	Vehicle exhaust, catalytic converter and engine; motorcycle exhaust	Vehicle engine switched off during refuelling
Flames and hot gases	present	Cigarettes, lighters, matches; hot work (welding, grinding)	No smoking and no naked flames (Annex 4 signs); hot work only with a written permit
Mechanical sparks	present	Vehicle hitting a dispenser; metal tools falling	Island kerb and dispenser crash barrier; shear valve under the dispenser
Electrical equipment	present	Dispenser pump motor and electronic head, payment terminal, island and canopy lighting, advertising screen, vehicle electrics	Equipment in the zone is Ex and suitable for gas group IIA and temperature class T3; the dispenser electronic head per the manufacturer's zone drawing; emergency stop button
Stray currents and cathodic protection	present	Cathodic protection of buried pipes and tanks; earth faults	Equipotential bonding; dispenser housing earthed
Static electricity	present	Fuel flow in the hose and filter; people getting in and out of vehicles; filling plastic cans	Conductive hose and nozzle earthed through the dispenser; cans placed on the ground for filling; no getting in or out of the vehicle during refuelling
Lightning	present	Canopy, lighting poles, price sign	Periodic inspection of earthing and lightning protection
Radio-frequency electromagnetic waves	present	Mobile phones, radios, nearby transmitter antennas	No mobile phone use during refuelling (warning sign)

The other 5 types assessed are not present in this area: optical radiation, ionising radiation, ultrasound, adiabatic compression and shock waves, exothermic reactions (including self-ignition).

axosfer SAMPLE

6.1.6 Equipment and suitability

Table 6.10 – Equipment suitability – A-1 Pump islands

Suitability of the equipment for the zone it is in. suitable: category, group and temperature class sufficient; unsuitable: replace or move out of the zone; information missing: check the Ex label or certificate; outside the zones: not in a hazardous area.

No.	Equipment	Zone	Ex marking / category	Result	Reason
E-1	Dispenser (hydraulic section and pump motor)	Zone 1	II 2G IIA T3 (EN 13617-1)	suitable	Category suitable (2G ≤ 2G); group suitable (IIA ≥ IIA); temperature class suitable (T3)
E-2	Dispenser electronic head and payment terminal	–	–	outside the zones	Not in a hazardous area
E-3	Island and canopy lighting	–	–	outside the zones	Not in a hazardous area
E-4	Emergency stop button	–	–	outside the zones	Not in a hazardous area

6.1.7 Explosion risk

Table 6.11 – Explosion scenarios – A-1 Pump islands

The event sequence of each scenario: initiating event → explosive atmosphere and possible ignition source → possible consequence. The code in brackets is the related source (K-) or equipment (E-).

No.	Scenario	Initiating event	Explosive atmosphere and ignition	Possible consequence
R-1	Release and ignition (K-1)	Periodic release in normal operation	Vehicle tank filler neck – Zone 1, r = 1.5 m (petrol); ignition: equipment safe in normal operation and in expected malfunctions (category 2)	Local flash fire in open air; injury, equipment damage
R-2	Release and ignition (K-2)	Malfunction: loss of containment (gasket, packing, connection)	Inside of the dispenser housing and the pit below – Zone 1 (petrol); ignition: equipment safe in normal operation and in expected malfunctions (category 2)	Local flash fire in open air; injury, equipment damage
R-3	Release and ignition (K-3)	Malfunction: loss of containment (gasket, packing, connection)	Small spill on the island floor – Zone 2, r = 2.0 m (petrol); ignition: equipment safe in normal operation (category 3)	Local flash fire in open air; injury, equipment damage
R-4	Opening of lines during maintenance	Equipment opened for maintenance or cleaning (filter change, cleaning of nozzles and pumps, container change)	Local explosive atmosphere at the opening; ignition: hand tools, portable devices, hot work	Local flash fire in open air; injury, equipment damage
R-5	Hot work without a permit	Welding, cutting or grinding without a permit or gas measurement (including contractors)	Naked flames and sparks inside Zone 1	Local flash fire in open air; injury, equipment damage

axosfer SAMPLE

No.	Scenario	Initiating event	Explosive atmosphere and ignition	Possible consequence
R-6	Electrostatic discharge (K-1, K-3)	Charge build-up during filling, transfer, mixing or pneumatic conveying; unearthed container or person	Static discharge (spark or brush discharge) inside Zone 1	Local flash fire in open air; injury, equipment damage

Table 6.12 – Risk scoring – A-1 Pump islands

Scores of the scenarios now and after additional measures. Pex: probability of an explosive atmosphere; Pign: probability of an effective ignition source; L = Pex + Pign − 4; S: severity; R = L × S. Levels: negligible–low, medium, high, intolerable. The 'after' columns are the values expected once the proposed measures are in place.

No.	Existing measures	Pex	Pign	L	S	R	Additional measures	After Pex · Pign · S	After R
R-1	–	4	2	2	3	6	AK-1: document Ex suitability of the electric vehicle charger or move it out of the zone	4 · 2 · 3	6
R-2	–	4	2	2	3	6	No additional measure needed; existing measures and conditions of validity are maintained	4 · 2 · 3	6
R-3	–	2	3	1	3	3	No additional measure needed; existing measures and conditions of validity are maintained	2 · 3 · 3	3
R-4	Annex 2, 1.2 (met): written permits are used for hot work, manhole and tank entry	3	2	1	3	3	Confirm that the permit form includes the line-opening steps: draining the line, gas measurement, non-sparking hand tools	2 · 2 · 3	3
R-5	Instruction; training (on starting work and yearly); permits (hot work, electrical, line opening); PPE; Annex 4 warning sign at hazardous area entrances; Annex 2, 1.2 (met): written permits are used for hot work, manhole and tank entry	4	2	2	3	6	Hot work permit, gas measurement, fire watch; coordination with contractors (Art. 8)	2 · 2 · 3	3
R-6	Annex 2, 2.3 (met): earthing measured yearly; earthing connected during tanker unloading	4	2	2	3	6	Earthing of containers, hoses and people; conductive footwear and clothing; low flow velocity (IEC TS 60079-32-1)	4 · 2 · 3	6

axosfer SAMPLE

6.1.8 Findings and actions

- The deficiencies found on site are addressed by the 2 open actions below. Most urgent: AK-1 (high, due 31.12.2026); until then: If fuel is spilled near the unit, its power is switched off and not restored until the spill is cleaned up.

Table 6.13 – Open actions of the area – A-1 Pump islands

Actions for this area not yet completed, and the interim measures that apply from today until they are due. Responsibilities are in Section 13.

No.	Action	Priority	Due	Until completed (interim measure)
AK-1	The electric vehicle charger is inside the calculated zone (dispenser: 5 m ≤ 5.5 m → Zone 1 (K-1)). Document that the unit is suitable (Ex) for the zone, or move it outside the zone.	high	31.12.2026	If fuel is spilled near the unit, its power is switched off and not restored until the spill is cleaned up.
AK-2	A drain, manhole, grating or basement entrance is inside the calculated zone (fill point: 4 m ≤ 5 m → Zone 2 (K-8)); heavy vapour can enter it. Close it, or prevent vapour ingress with a sealed cover and a trap; if it stays open, classify its interior as Zone 1 and select the equipment accordingly.	high	31.12.2026	If fuel is spilled, its flow into pits and drains is stopped at once with absorbent material.

axosfer
SAMPLE

13 Action plan

13.1 Actions

Table 13.1 – Action plan

All actions: open ones first, in order of priority, then completed ones. The Status column (open / planned / done) tracks progress.

No.	Action	Area	Priority	Responsible	Due	Status
AK-1	The electric vehicle charger is inside the calculated zone (dispenser: 5 m ≤ 5.5 m → Zone 1 (K-1)). Document that the unit is suitable (Ex) for the zone, or move it outside the zone.	A-1	high	Site operator	31.12.2026	open
AK-2	A drain, manhole, grating or basement entrance is inside the calculated zone (fill point: 4 m ≤ 5 m → Zone 2 (K-8)); heavy vapour can enter it. Close it, or prevent vapour ingress with a sealed cover and a trap; if it stays open, classify its interior as Zone 1 and select the equipment accordingly.	A-1	high	Site operator	31.12.2026	open
AK-3	Verification of the explosion protection measures before putting into operation (Annex 2, 2.8)	general	medium	Competent person	31.12.2026	open

13.2 Interim measures until the actions are completed

Until the actions are due, the risk is kept at an acceptable level with the interim measures below. They apply from today, are checked on inspection rounds and are lifted once the related action is completed and verified.

Table 13.2 – Interim measures

For each open action, the interim measure that keeps the risk acceptable until it is due.

No.	Action	Due	Interim measure (from today)
AK-1	The electric vehicle charger is inside the calculated zone (dispenser: 5 m ≤ 5.5 m → Zone 1 (K-1)). Document that the unit is suitable (Ex) for the zone, or move it outside the zone.	31.12.2026	If fuel is spilled near the unit, its power is switched off and not restored until the spill is cleaned up.
AK-2	A drain, manhole, grating or basement entrance is inside the calculated zone (fill point: 4 m ≤ 5 m → Zone 2 (K-8)); heavy vapour can enter it. Close it, or prevent vapour ingress with a sealed cover and a trap; if it stays open, classify its interior as Zone 1 and select the equipment accordingly.	31.12.2026	If fuel is spilled, its flow into pits and drains is stopped at once with absorbent material.

Actions without an interim measure: AK-3; for it, the existing measures are considered sufficient.

14 Conclusions and recommendations

14.1 Conclusion

At Sample Fuel Station (fictional), 2 areas were assessed and hazardous zones were identified (Zone 0, Zone 1, Zone 2). Results by area:

- A-1 Pump islands – Zone 1 (around K-1, r = 1.5 m), Zone 1 (around K-2), Zone 2 (around K-3, r = 2.0 m)
- A-2 Tank area, fill points and vent pipes – Zone 0 (around K-5), Zone 1 (around K-6), Zone 2 (around K-8, r = 5.0 m), Zone 1 (around K-9, r = 2.5 m)

The zone boundaries are shown in the drawings of Annex A; the minimum equipment category, group and temperature class required by each zone are given in Section 5.3.

13 scenarios were scored in the risk assessment. The highest current risk is medium (R-12, hot work without a permit, A-2; R = 12); with the proposed measures the highest risk remains medium (R = 12).

Once the 3 open actions of the action plan are completed, and as long as the conditions of validity are met, the explosion risk at the site is assessed to be at an acceptable level. Priority actions:

- AK-1 The electric vehicle charger is inside the calculated zone (dispenser: 5 m ≤ 5.5 m → Zone 1 (K-1)). Document that the unit is suitable (Ex) for the zone, or move it outside the zone. – high; responsible: Site operator; due: 31.12.2026
- AK-2 A drain, manhole, grating or basement entrance is inside the calculated zone (fill point: 4 m ≤ 5 m → Zone 2 (K-8)); heavy vapour can enter it. Close it, or prevent vapour ingress with a sealed cover and a trap; if it stays open, classify its interior as Zone 1 and select the equipment accordingly. – high; responsible: Site operator; due: 31.12.2026
- AK-3 Verification of the explosion protection measures before putting into operation (Annex 2, 2.8) – medium; responsible: Competent person; due: 31.12.2026

Until the actions are completed, the interim measures of Section 13.2 apply.

This document is revised before work starts and whenever there are significant changes, extensions or conversions of the workplace, the work equipment or the organisation of work (Art. 10(3)). Next review: 13.10.2027 or on change.

axosfer SAMPLE

14.2 Assumptions, expert decisions and limitations

The results rest on the assumptions and expert decisions below. Each row states why the assumption was chosen and how it is verified or monitored: the Annex C sensitivity analysis, a condition of validity (G-) or an action (AK-). If an assumption changes, the related calculation and zone are reassessed (Section 12.2).

Table 14.1 – Assumptions register

Assumptions behind the results, expert decisions that differ from the calculation (yellow) and limitations (grey). The last column shows how each one is verified or monitored.

No.	Type	Subject	Assumption / decision	Reason / basis	How it is verified / monitored
V-1	assumption	Wind speed, conservative (K-1, K-3, K-7, K-8, K-9)	u_w = 0.30 m/s	IEC 60079-10-1 Annex C / expert	Annex C: the decision does not change for the values tested
V-2	assumption	Availability of ventilation (K-1, K-3, K-7, K-8, K-9)	Availability = good	expert	conditions of validity and inspection plan (Section 12)
V-3	expert decision	Zone decision K-2	→ Zone 1	Narrow internal spaces with little air movement (low dilution); Table D.1: secondary grade + low dilution → Zone 1; internal zones from the manufacturer's drawing to EN 13617-1. [to be checked against the standard]	reasoning and the expert's responsibility
V-4	expert decision	Zone decision K-5	→ Zone 0	Inside a closed vessel the release is continuous and there is no dilution; by the principle of Table D.1 (continuous grade, low dilution) Zone 0. All equipment inside the tank (level probe, submersible pump) must be category 1G.	reasoning and the expert's responsibility
V-5	expert decision	Zone decision K-6	→ Zone 1	Covered, unventilated pit below ground: heavy vapour accumulates and does not disperse (low dilution; pits are treated like enclosed spaces, IEC 60079-10-1 C.3.5). Table D.1: secondary grade + low dilution → Zone 1. Equipment inside at least category 2G.	reasoning and the expert's responsibility

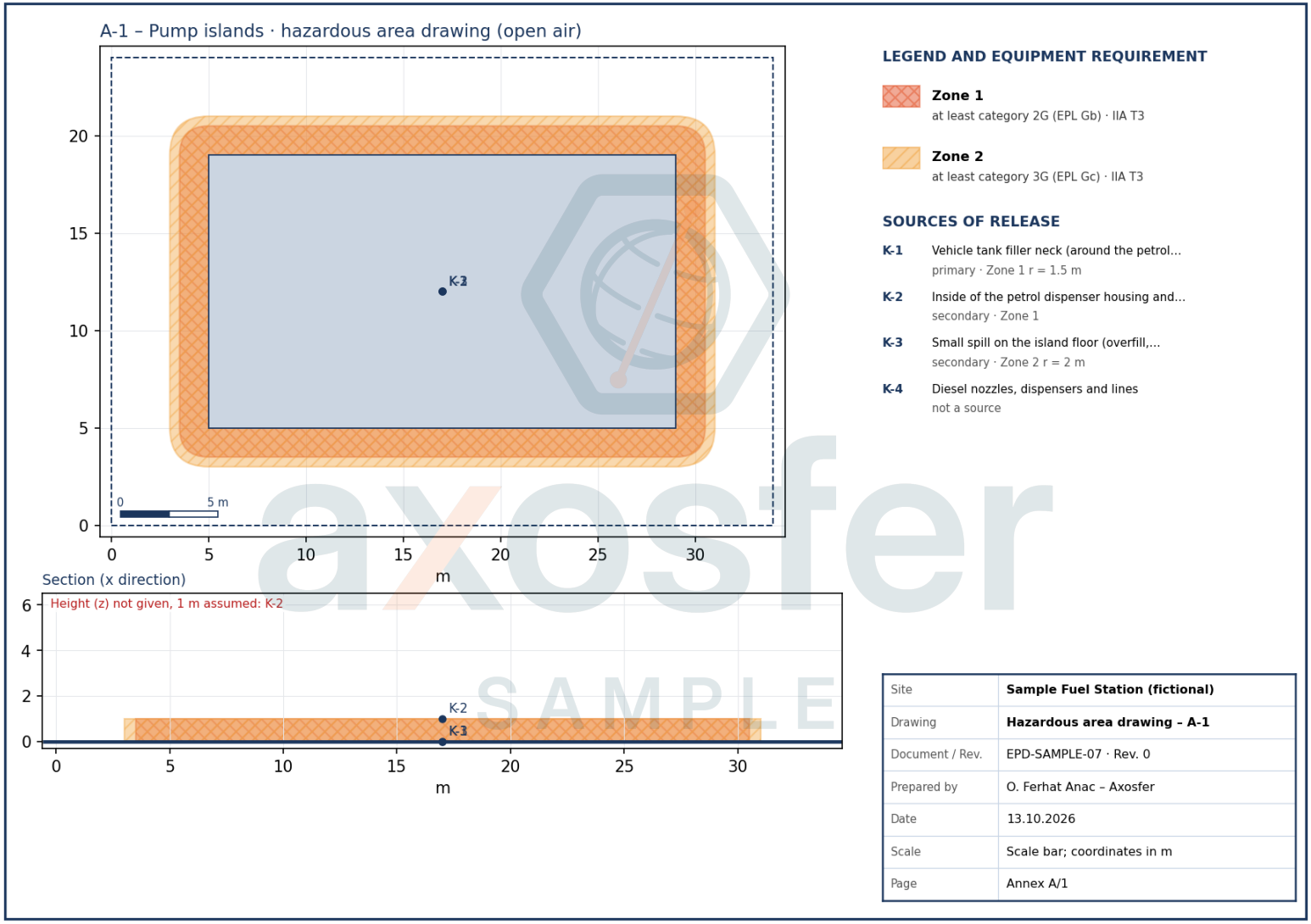
axosfer SAMPLE

No.	Type	Subject	Assumption / decision	Reason / basis	How it is verified / monitored
V-6	assumption	Substance data: petrol (unleaded)	LFL 1.40 %; AIT 280 °C; group IIA	LFL, UFL, flash point, AIT: IEC 60079-20-1:2010 table (gasoline, CAS 8006-61-9). Vapour molar mass 66 kg/kmol and vapour pressure correlation: US EPA AP-42 Section 7.1 (October 2024). DVPE limits and density: the refiner's product specification for unleaded petrol (EN 228). Gas group IIA: established classification for petrol [to be checked against the standard]. The vapour pressure is a design value, not the 20 °C value: summer (DVPE 60 kPa, 35 °C) 58.6 kPa; winter (DVPE 90 kPa, 20 °C) 55.7 kPa; the larger is used.	substance card (Section 4.5); reassessed if the composition changes
V-7	assumption	Substance data: diesel fuel	AIT 220 °C; group IIA	Mixture: values from the product's safety data sheet	substance card (Section 4.5)
V-8	assumption	Chemical screening: process temperature	35 °C	process temperature not given; summer ambient temperature used	Section 4.3 is updated once the process temperature is known
V-9	limitation	Scope	Excluded from the scope	The tanker itself (responsibility of the carrier)	separate assessment
V-10	limitation	Site condition	condition at the site visit of 09.10.2026	the assessment rests on the layout, equipment and operating conditions of that day	on change, Section 12.2
V-11	limitation	Values from standards	values marked [to be checked against the standard]	the full text of the standard was not available for this work	checked against the current edition of the standard
V-12	limitation	Data	site and data are fictional	sample study	cannot be used for a real workplace

axosfer SAMPLE

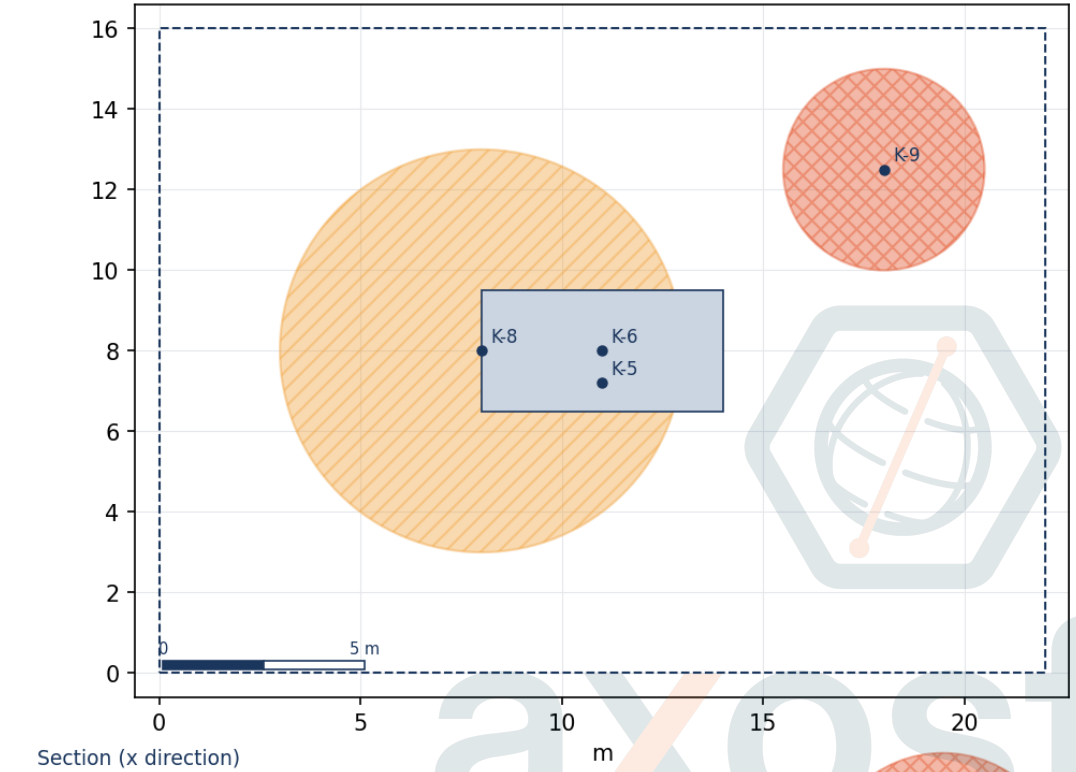
Annex A Hazardous area drawings

A titled hazardous area drawing for each area (plan, with a section for wide plans) follows on the landscape pages. The legend also gives the minimum equipment category, group and temperature class required by each zone.

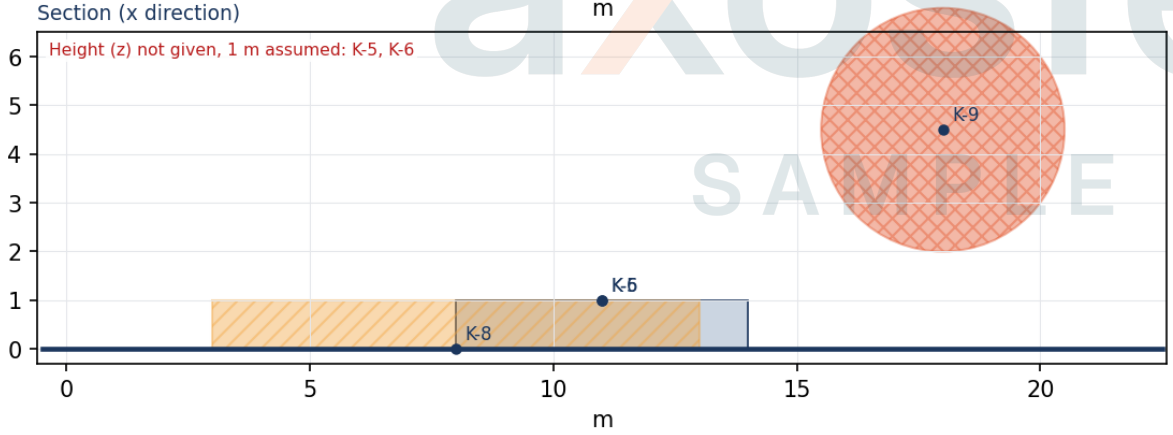


axosfer
SAMPLE

A-2 – Tank area, fill points and vent pipes · hazardous area drawing (open air)



Section (x direction)



LEGEND AND EQUIPMENT REQUIREMENT

Zone 1
at least category 2G (EPL Gb) · IIA T3

Zone 2
at least category 3G (EPL Gc) · IIA T3

SOURCES OF RELEASE

K-5 Inside of the petrol tanks (vapour space);…
continuous · Zone 0

K-6 Tank manholes and fill point boxes (below…
secondary · Zone 1

K-7 Tanker unloading hose connections (connecting…
primary · non-hazardous (negligible extent)

K-8 Large spill during tanker unloading (hose…
secondary · Zone 2 r = 5 m

K-9 Vent pipe outlets – vapour released during…
primary · Zone 1 r = 2.5 m

K-10 Diesel tanks, fill points and vent pipes
not a source

Site	**Sample Fuel Station (fictional)**
Drawing	**Hazardous area drawing – A-2**
Document / Rev.	EPD-SAMPLE-07 · Rev. 0
Prepared by	O. Ferhat Anac – Axosfer
Date	13.10.2026
Scale	Scale bar; coordinates in m
Page	Annex A/2

axosfer SAMPLE

Basis of this document and signature

This document is based on the documents provided by the employer and on the condition seen at the site visit of 09.10.2026. Assumptions made where documents were missing or something could not be seen are listed in Section 14.2. Changes to the workplace, the equipment or the process after the visit require the document to be reviewed (Art. 10(3)).

The pages are numbered (Page n of N). Each page is initialled by the preparer and by the employer or the employer's representative in the field at the bottom left; this last page is signed below.

	Prepared by	Approved by (employer / representative)
Name	O. Ferhat Anac	
Title	Chemical Engineer, Class A OHS Specialist	Employer / employer's representative
Date	13.10.2026	
Signature		

axosfer
SAMPLE