Checklist: PU industry activities → Process categories (PROCs) (June 2014)

PU examples (for industrial and/or professional use*)	PROCs**
1. Production of chemicals	
• Production in technically "tight" equipment, typically in a large industrial scale, as e.g. for polyols or isocyanates (or precursors)	1
• Storage, blending operations, pipeline transport, etc. in technically "tight" equipment	1
• Medium scale industrial production of isocyanate terminated prepolymers – continuous / discontinuous	2 / 3 / 4
2. Delivery (loading / unloading / transfer of substances into containers)	
• Tank truck with dedicated vapour return line	8b
• Transfer to or from container/vessels with dedicated equipment under use-specific safety standards (e.g. in mining industry)	8b
• Transfer to or from drums/cans with dedicated equipment under industrial safety standards	9
• Tank truck unloading / transfer from drums (non-dedicated)	
• All other non-routine transfers or transfers where no dedicated equipment is available	8a
3. Mixing, blending of chemicals	
• Enclosed blending of chemicals – continuous / discontinuous	2 / 3
• Blending of chemicals in almost closed reactors or vessels	4
• Open blending of chemicals.	5
4. Enclosed PU production processes	
• Blow line injection in technically "tight" equipment for composite wood production	1
• Storage, blending operations, pipeline transport, etc. in technically "tight" equipment	1
• Enclosed automated PU production (continuous / discontinuous), including controlled exposure e.g. during sampling, maintenance, equipment breaks, equipment cleaning	2 / 3
- Enclosed block production – continuous / discontinuous	2 / 3
- Enclosed panel production – continuous / discontinuous	2 / 3
- Enclosed pressing operations	3
- Injection into closed mould	3
• Closed cavity filling	3
• Spraying in cabinet or in underpressure (spray booth - industrial safety standards)	7
5. Open PU production processes	
• Open PU production (continuous or discontinuous), including controlled exposure e.g. during sampling, maintenance, equipment breaks, equipment cleaning	4
- Open block production	4
- Pouring into open mould, on open conveyor or in box	4
- Casting, cavity filling, other open uses	4
• Application of coating, adhesive or dispensing of One Component Foam (OCF) by low energy spreading	10
• Dispensing of two component foam by low energy spreading (e.g. in mining industry, rock lock, grouting)	10
• Spray foam application by professional workers using PPE	11
• Application of coatings via dipping or pouring	13
• Rebonding of PUR flakes or particles; forming/curing prepregs (PU impregnated mats) in a hot mould, forming/pressing of minerals (e.g. in foundry industry)	14
6. Activities before final curing	
• Demoulding; "foam crushing" (compression of foam for cell-opening); trimming; repairing; cutting of PU articles, Sawing with low energy through soft articles (flexible foam, rigid foam, adhesives)- before they are fully cured	21
• Sawing through hard PU articles, e.g. wood	24
7. Chemical waste collection & transfer	
• With dedicated (closed) equipment	8b
• Open collection	8a
8. Mechanical cleaning operations	
• Removal of solidified material from containers, vessels, blenders (e.g. with hammers)	24
• Cleaning with high pressure air (industrial / professional)	7 / 11
• Cleaning with brush	10
9. Quality / Process control in laboratories	
• Use of chemical in a laboratory environment, typically limited to 1 kg or 1 L of the chemical; working in extracted cabinet / booth / fume hood, if necessary	15

*Note: PROCs are not applicable for consumer uses.
** Please check details of the relevant PROCs (below)

Checklist: Process categories (PROCs) → PU industry examples

PROCs	Official description and PU examples (for industrial and/or professional use* :
PROC 1:	Use in closed process, no likelihood of exposure. Use of the substances in high integrity contained system, where little potential exists for exposures, e.g. any sampling via closed loop systems. E.g. large scale industrial production of polyols or isocyanates (or pre-cursors), including enclosed sampling, waste collection & transfer, charging (via pipeline), filtering, sieving, discharging, blow line injection for composite wood production, blender operations, storage.
PROC 2:	Use in closed, continuous process with occasional controlled exposure. Continuous process, but where the design philosophy is not specifically aimed at minimizing emissions. It is not high integrity* and occasional exposure** will arise e.g. through maintenance, sampling and equipment breakages *E.g. industrial scale continuous production of isocyanate terminated prepolymers or in line mixing with additives or enclosed automated continuous PU production, like enclosed panel or block production, including mixing, heating, refluxing, distillation. **Controlled exposure e.g. during sampling, charging, sawing, discharging, maintenance, equipment cleaning, occasional interventions/inspections inside enclosed areas, checking quality of sand mix).
PROC 3:	Use in closed batch process (synthesis or formulation). Batch manufacture of a chemical or formulation where the predominant handling is in a contained manner*, e.g. through enclosed transfers, but where some opportunity for contact with chemicals occurs**, e.g. through sampling. * E.g. medium scale batch production of isocyanate terminated prepolymers or closed (IBC) manufacture of polyol formulation or enclosed automated discontinuous PU production, like enclosed panel or block production, closed cavity filling, injection into closed mould, including mixing, heating, refluxing, distillation, blending, sawing in cabinet. **Controlled exposure e.g. during sampling, maintenance, equipment breaks, equipment cleaning, occasional interventions, waste collection & transfer, charging, discharging, checking quality of sand mix).
PROC 4:	Use in batch and other [continuous] process (synthesis) where opportunity for exposure arises. Use in batch [or continuous] manufacture of a chemical* where significant opportunity for exposure arises**, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure. *E.g. blending of chemicals in almost closed reactors or vessels or pouring into open mould, pouring on open conveyor or in box, casting, during mat dumping, cavity filling and other open uses, including mixing, heating, refluxing, distillation, filtering. **Controlled exposure e.g. during use, sampling, maintenance, equipment breaks, equipment cleaning, waste collection & transfer, occasional interventions at open areas, open sawing.
PROC 5:	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact). Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage. E.g. open blending of chemicals.
PROC 6:	*Calendering - not relevant*
PROC 7:	Industrial spraying. Air dispersive techniques. Spraying for surface coating, adhesives, polishes/cleaners, air care products, sandblasting. Substances can be inhaled as aerosols. The energy of the aerosol particles may require advanced exposure controls; in case of coating, overspray may lead to waste water and waste. E.g. spraying inside cabinet (spray booth) under industrial safety standards.
PROC 8a:	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities. Sampling, loading, filling, transfer, dumping, bagging in non-dedicated facilities. Exposure related to liquid, dust, vapour, aerosols or spillage, and cleaning of equipment to be expected. E.g. "non-dedicated" [no specialised equipment designed for the purpose or non-routine transfers] loading/unloading of chemicals from tank truck, IBC or drum; charging/discharging of chemicals, including liquid and solid MDI, from/to drums - in industrial or professional use - including sampling, waste collection & transfer, dispensing.

PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities.
Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to liquid, dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
E.g. loading/unloading of chemicals, including liquid and solid MDI, from tank truck with dedicated vapour return line or enclosed transfer of MDI / polyol formulation from bulk, IBC ordrum to day tank or vessels, including sampling, waste collection & transfer, charging, discharging, dispensing.

PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing).
Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage.
E.g. "dedicated" transfer from/to drums or re-packaging in small containers or re-bulking from drums under industrial safety standards.

PROC 10: Roller application or brushing. Low energy spreading of e.g. coatings.
Including cleaning of surfaces. Substance can be inhaled as vapours, skin contact can occur through droplets, splashes, working with wipes and handling of treated surfaces.
E.g. application of coating or adhesive
AND dispensing of One Component Foam (OCF), or two-component foam (e.g. in mining industry, rock lock, grouting)
Cleaning with brush
Rolling films

PROC 11: Non industrial spraying. Air dispersive techniques.
Spraying for surface coating, adhesives, polishes/cleaners, air care products, sandblasting.
Substances can be inhaled as aerosols. The energy of the aerosol particles may require advanced exposure controls.
E.g. PU spray application by professional workers using PPE.

PROC 12: Related to blowing agents – not relevant for isocyanates or polyols

PROC 13: Treatment of articles by dipping and pouring.
Immersion operations.
Treatment of articles by dipping, pouring, immersing, soaking, washing out or washing in substances; including cold formation or resin type matrix. Includes handling of treated objects (e.g. after dying, plating).
Substance is applied to a surface by low energy techniques such as dipping the article into a bath or pouring a preparation onto a surface.
E.g. application of coatings via dipping or pouring.

PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation.
Processing of preparations and/or substances (liquid and solid) into preparations or articles. Substances in the chemical matrix may be exposed to elevated mechanical and/or thermal energy conditions. Exposure is predominantly related to volatiles and/or generated fumes, dust may be formed as well.
E.g. non-enclosed rebonding of PUR foam flakes or particles; non-enclosed forming/curing of prepregs (PU impregnated mats) in a hot mould. Preparation/compounding of TPU. non-enclosed forming/pressing of minerals (e.g. in foundry industry)

PROC 15: Use as laboratory reagent.
Use of substances at small scale laboratory (< 1 L or 1 kg present at workplace).
- Larger laboratories and R+D installations should be treated as industrial processes. -
E.g. quality control in extracted cabinet / booth / fume hood, if necessary.

PROC 16 - 18: Not relevant for isocyanates or polyols
PROC 19: ***Not applicable, because of no scenario with intimate and intentional contact → use PROC 5 instead.***
PROC 20: Not relevant for isocyanates or polyols

PROC 21: Low energy manipulation of substances bound in materials and/or articles. Manual cutting, cold rolling or assembly/disassembly of material/article (including metals in massive form), possibly resulting in the release of fibres, metal fumes or dust.
E.g. PU article treatment like demoulding, trimming, "foam crushing" (compression of foam for cell-opening), repairing, cutting of soft PU articles before they are fully cured.

PROC 22 – 27: Not relevant for isocyanates or polyols

Special PROCs for mechanical cleaning operations:
PROC 24: Removal of solidified material from containers, vessels, blenders with high mechanical energy (e.g. with hammers), potentially causing dust/aerosol formation.
PROC 7 / 11: Cleaning with high pressure air.
PROC 10: Cleaning with brush.

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