COMBUSTIBILITY OF SCRAP METAL GRADES – August 2020

This document is a short interim guide of common scrap (waste) metal grades that demonstrate very low or low combustibility risk in air, based on industry knowledge of the fundamental metal components comprising these metal grades and the known, low contamination levels of these grades.

There are many grades of scrap metals as can be seen in the ISRI (Institute of Scrap and Recycling Industries) Guide (April 2018) but this brief document will focus on the most common grades of low combustibility metal grades.

Combustibility describes the highly exothermic oxidation of materials (solid, liquid or gas) in air or in other words the exothermic chemical reaction between a combustible material and oxygen in the air (e.g. rubber or wood burning in air).

Outlined below are common extremely low / low combustible metals and the metal grades of scrap metal wastes that contain them, encountered in the scrap metal industry.

VERY LOW OR LOW COMBUSTIBLE FERROUS GRADES

Ferrous metals (iron and steel) are reactive with oxygen (thermodynamically) and will burn (combust) in air under certain conditions such as in finally divided forms (e.g. iron filings in a flame). The ferrous metals outlined in this document are classified as having an extremely low or low combustibility risk as they will not burn in air due to the massive form that they exist in. In physical chemical terms they may in theory react thermodynamically with oxygen in the air (i.e. oxidise slowly) but not kinetically and therefore exothermically with oxygen (i.e. combust) and will slowly form iron oxides e.g. ferric oxide or rust on the surface.

1. OA / OSPG Iron and steel (Fe) / Plate and Girder / Bonus – RISK VERY LOW

Fig 1. OA Iron and Steel

'OA' is the largest ferrous grade normally encountered and the cut girders shown in figure 1 are normally at the lower sized end of this particular grade of iron and steel and much larger lumps of iron and steel are found in this grade (common sources include demolition scrap). Where this material is graded as OSPG, it is processed and cut/sheared in smaller manageable pieces, but generally this material is 'furnace ready' product and does not require any further processing.

Due to the large volume to surface area ratio of this grade, this material is kinetically stable in oxygen in the air and therefore will not combust even at extremely high temperatures.

Contamination levels are normally very low (< 0.3%) and any contamination which is present is also of limited combustibility (normally comprising very small amounts of brick dust, concrete, stones etc.) or has low combustibility; additionally much of it will normally fall out on to the floor (especially when being transferred by grab crane).

2. No. 1 & 2 (Iron and Steel) or HMS – RISK LOW

Fig 2. No. 1 & 2 (HMS)

No. 1 / 2 (or HMS – Heavy Metal Scrap Iron and steel) is the next grade down from OA in terms of size and comprises large pieces of iron or steel including plates, tubes (scaffold poles) etc. as shown in figure 2. Similarly, to OA the large size of this ferrous material renders it kinetically stable in air (due to the large volume to surface area ratio) and No. 1 /2 will therefore not combust.

Contamination levels are still extremely low but can be slightly higher than that exhibited by OA but are normally at levels of less than 1.5%. This material is furnace ready and is normally exported for smelting.

3. Frag or '3b' (Shredded) – RISK VERY LOW

Fig 3. 'Frag' (3b)

'Frag' or fragmentised ferrous metals is a furnace ready product produced by the shredding (or fragmentising) of light iron and steel graded (e.g. shredded light iron) and is also commonly known (in grade terms) as '3b'. Any non-ferrous metals or non-metallic materials are separated out as part of the shredder or fragmentiser process, leaving a high quality, furnace ready iron and steel product. The size of this ferrous grade varies from about marble sized lumps of metal to fist sized lumps and similarly to the grades above, the relatively large volume to surface area renders the material kinetically stable in air and therefore it can be classified as very low risk.

Contamination levels are extremely low and are normally below 0.3%

4. 8B (Cuttings / Off-cuts) – RISK VERY LOW

Fig 4-5. (8B Cuttings / Off-cuts)

8B cuttings are thin pieces of galvnaised steel. They are clean and have no contamination with no combustability risk.

Clean new production steel scrap (for example sheet clippings & cuttings). May include an agreed proportion of coated material, but excluding tin coated, terne coated and enamelled material. Similarly, to grades mentioned above the large size of this ferrous material renders it kinetically stable in air (due to the large volume to surface area ratio).

As this material is from new production contamination is unlikely.

5. 4C (Small Bales) – RISK VERY LOW

Fig 6. 4C (Small Bales)

New production compressed steel sheet (less than 6mm thick) Bales in works furnace sizes, including a proportion of coated material, but excluding tin, enamel and terne coating, stamping and forging flash, bar and billet ends and other high residual material. Tightly baled and free from loose material.

As this material is from new production contamination is unlikely.

6. OSB (Over Size Burning) – RISK VERY LOW

Fig. 7. OSB (Oversize Burning)

This ferrous metal grade is too thick and/or large to reduce in size mechanically. This material must be reduced in size by flame cutting.

This material will be heaped with 'OA Iron and Steel' following processing – Therefore properties / description of combustibility is as detailed above (section 1).

7. OSHE (Over Size Material to be Sheared) – RISK VERY LOW

Fig 8-10. OSHE (Over Size Shearing)

OSHE is a thin density scrap and comes in all shapes and sizes. This scrap grade is generally clean with extremely low contamination (if any).

8. OSPR (Over Size Material to be Sheared) – RISK VERY LOW

Fig 11-12. OSPR (Over Size Shearing)

This is a skeleton profile, which is rather thick and heavy. Once processed through the shear it is then stocked as 12A (See below). Contamination is low with limited combustibility.

9. 12A – RISK VERY LOW

Fig 13-15. 12A

This is material that has been processed (originally OSPR – see above). Contamination is low with limited combustibility and is now considered furnace ready.

10. Cargo Bottoms – RISK LOW

Fig. 16. Cargo Bottoms

'Cargo Bottoms' are a build-up of residual soil / concrete / dirt / non-metallics from scrap material received inwards. Although material accepted inwards will be clean and free from contamination there will still be an accumulation of dirt over time (i.e. 40,000 tonnes of scrap material with 1% dirt contamination will leave a 'cargo bottoms' stockpile of 400 tonnes).

As 'cargo bottoms' stockpiles mainly consist soil / concrete / dirt they will have an extremely low combustibility risk.