Z35 - CONTROLLED SHOT PEENING

IRAL-NH[Z35]0001

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Z35 CONTROLLED SHOT PEENING

To be read with A00 Architectural Preliminaries.

100 REFERENCE DOCUMENTS
- Aerospace Material Specification AMS-S-13165, November 1997
- American Society For Testing And Materials E 11-95
- In all situations within the reference documents, read CA in lieu of Government.
- The documents are available for inspection at the office of Ian Ritchie Architects Ltd.
- In the event of a conflict between this specification and the reference documents, this document shall take precedence.

110 SHOT PEENING PROCESSORS
- The following contractors are a suitable source of suitable shot peening:

Wheelabrator Group Ltd
107-109 Whitby Road
Slough
Berks, SL1 3DR
Tel. 01753 215 673

TYPES OF SHOT PEENED FINISHES

152 SHOT PEENED FINISH TYPE "53-114c"

- Peening media material:	Mild Steel subject to Clause 690	1st pass
	Glass	2nd pass
- Min. sheet thickness:	3mm	
- Appearance:	To Wheelabrator sample reference 53 (114c)	
- Polishing before peening	As clause Z35/235	
- Chemical cleaning:	As clause Z35/240	

153 SHOT PEENED FINISH TYPE "53-114j NH"

- Peening media material:	Glass
- Peening media size:	To Wheelabrator sample reference 53 (114j NH)
- Intensity:	To Wheelabrator sample reference 53 (114j NH)
- Min. sheet thickness:	1.6mm
- Appearance:	to match sample
- Chemical cleaning:	As clause Z35/240

SAMPLES

160 FINISHES SAMPLES
- The Contractor to submit 6 No 300mm x 200mm samples of each proposed shot peened finish prior to commencing any peening. All submitted samples shall be individually to be identified and labelled etc.

165 INFORMATION TO BE SUBMITTED WITH SAMPLES
- The following technical information shall be provided for each submitted sample.

a) Name of processor
b) Identification of each media type used to process each surface of sample including
   i. media material
   ii. media size
   iii. media supplier/manufacturer
c) Evidence of impact energy/peening intensity control using Almen strips or equivalent system.
d) Saturation: submission of saturation curve for sample.

e) Coverage Control: evidence of coverage control using peen scan or equivalent system to verify uniformly and extent of coverage for sample.

170 SHOT PEENING PROTOTYPE

- For complex 3 dimensional elements the Contractor to submit a representative sample of the components to the relevant work section.

PRIOR TO SHOT PEENING

200 STAINLESS STEEL

- All stainless steel material to be supplied from a single source.
- Prior to placing an order for the material the Contractor to issue representative samples of the material to be supplied to the stainless steel fabricator/metalworker and shot peening processor for their acceptance. Confirmation of acceptance of the material to be issued in writing.

210 IDENTIFICATION OF THE SURFACE TO BE SHOT PEENED

- The Contractor to select and identify the “best surface” of each plate in accordance with the criteria of clause 230. The “best surface” to form Face 1. The exposed face, Face 2, to be hidden.
- On Face 2 the following information to be permanently recorded using a method that will not affect the visual appearance, strength or corrosion resistance of the completed component:
  - Identification of face 2.
  - Identification of the project.
  - Supplier of the material.
  - Intended location of the component.
  - Intended orientation of the component.

220 HANDLING OF STAINLESS STEEL TO BE SHOT PEENED

- The Contractor to submit a written method statement for acceptance, for the inspection and handling of the stainless steel to ensure full compliance with the requirements of this Specification, including visual appearance, corrosion resistance and avoidance of contamination.
- The method statement to identify:
  a. All measures to minimise handling damage during all stages of the project before and after shot peening.
  b. All measures to completely eliminate contamination of the stainless steel surface at any stage of the project before and after shot peening.
  c. All measures to ensure any remedial works required to the components does not affect the full compliance with the requirements of this Specification.
- The method statement shall identify all processes and stages in the fabrication and installation of the works, including:
  - Manufacture and handling of material in the mill.
  - Fabrication and handling of the material in the workshop.
  - Shot peening and handling of the material by the processors.
  - Transportation of the material at all stages from the mill to site.
  - Installation and handling of material on site.
  - Protection of the works on site.
- The purpose of the above is to ensure processes and controls are in place to minimise the risk of damage to the material and surface finish throughout the fabrication transport and installation process.

230 FINISH OF STAINLESS STEEL PRIOR TO SHOT PEENING

- The finish of all stainless steel material to be shot peened shall be an equivalent surface roughness to a 2mm sheet stainless steel with a 2B mill finish in accordance with BS EN 10088-2.

- The Contractor shall allow for the polishing of thick stainless plate or extrusions to achieve an equivalent surface roughness to a 2mm sheet stainless steel with a 2B mill finish in accordance with BS EN 10088-2. i.e. not greater than 0.5 microns.
- The surface shall be free from visible oxidation, heat tint, stray arcing, swarf or grinding marks.
- The surface shall be carefully ground to remove all surface defects, without affecting the visual appearance of Face 1, or structural integrity of the component.
- All welds to Face 1, shall be polished to ensure the weld and joint are flush with no visible difference between the colour or profile of the weld, the heat affected zone and the parent metal.
- Structural stainless steel sections with ground welds require polishing to Z35/235 before cleaning and shot peening.
- Prior to peening, all surfaces of the component shall be chemically cleaned as clause 240.

235 POLISHING STAINLESS STEEL PRIOR TO SHOT PEENING

- Where required polishing to be by an automatic process to satin polished 240 grit to designation 2K in accordance with BS EN 10088-2 and fine polish designation 5 of BS1449-2. Ra um = approx. 0.4, 30% reflectivity at approx. 60 degrees.
- The sequence of polishing to be identical for identical components, and consistent between all components.
- The surface after polishing to be even, uniform and non-directional.
- After polishing the surface to be protected by application of a polyurethane sheet, minimum thickness 100µm, to be partially removed prior to welding, and entirely removed prior to shot peening.
- Polishing to be by tools and belts dedicated to stainless steel to avoid contamination of the stainless steel.
- The polishing bed and surrounding area to be cleaned and made free of any material or substance that may cause contamination of the stainless steel.
- Throughout the polishing process, strict measures to be taken to avoid contamination of the material with mild steel or any other materials.

240 CLEANING

- As required, all components to be shot peened must be chemically cleaned to remove any contamination that may have occurred during fabrication and handling in the works prior to shot peening.
- All shot peened elements are to be chemically cleaned post-shot peening.
- Supplier: Anopol Limited or approved equivalent:
- PO Box 177
- 70 Bordesley Street
- Birmingham B5 5QJ *
- United Kingdom
- Tel: +44 (0)121 632 6888
- Fax: +44 (0)121 631 2274
- Prior to cleaning, the Contractor to confirm in writing and seek acceptance of the CM of the proposed cleaning method and all materials.
- Cleaning must not cause stress corrosion cracking to the component or welds.

250 MASKING

- Where masking is required, refer to the Drawings.
- Masking to be in accordance with AMS-S-13165 clause 3.3.3.
- Prior to masking, the Contractor to provide for acceptance:
  - Sample of the masking material.
  - Sample of shot peened stainless steel that has been masked.
  - Written confirmation of proposed masking material specification.
- Masking material to be cut with a computer controlled plotter cutter.
- Masking to take account of all tolerances to precisely achieve the required visual appearance.
- All masking to be removable without leaving an adhesive residue.
- The removal of the masking must not affect the visual appearance, corrosion resistance or cause damage to the surfaces of the stainless steel, allowing full compliance with the requirements of this Specification.

PEENING

300 PEENING MEDIA

- Material in accordance with AMS-S-13165, 3.1.1
- Shot size to be in accordance with AMS-S-13165, 3.1.2
- Shot shape to be in accordance with AMS-S-13165, 3.1.3
- Media to be maintained in accordance with AMS-S-13165, 3.2.1 and 3.3.9
- Peening media may be of the following materials:
  - Stainless steel.
  - Mild steel.
  - Ceramic.
  - Glass.

  The size and material for peening media to be determined by the specified finish.
- All peening media to achieve a single specified finish must be from a single supplier.
- The selected material to be suitable to achieve a consistent even and uniform finish without inducing or causing corrosion in the finished component or welds.
- Where mild steel shot is the selected peening media, all shot peened surfaces to receive a second pass of shot peening using glass to liberate and remove all potential ferrous material from the stainless steel surface.
- Where avoiding passivation of the stainless steel is critical, ceramic or glass peening media must be used.
- Prior to peening the Contractor to supply 2No 250gramme bags of the selected peening media for each specified finish, and confirm the supplier, material and technical specification for each.
- The Contractor must not substitute peening media without seeking written consent and re-submission of all required samples, prototypes, testing and acceptances for the shot peened finish.

310 EQUIPMENT

- All shot peening is achieved using automatic shot peening equipment, with media control strictly in accordance with AMS-S-13165, 3.2.1.
- Hand shot peening must not be permitted on samples, prototypes or any part of the works without first receiving written consent.
- Peening to be by direct impact only, reflected media to be avoided.
- All media to be sieved in sieves designed and manufactured strictly in accordance with E 11-95.
- The sieve must not in any way introduce potential corrosion into the media.
- Sieves to be checked for compliance with E 11-95.

SHOT PEENED SURFACES

330 GENERALLY

- Shot peened surfaces to be consistent, even, smooth and non-directional, and appear consistent in terms of colour and reflectivity under all light conditions.
- The completed shot peened surface must in all respects match that of the accepted samples.
- No shot peening to be permitted on site except in respect of authorised remedial works in accordance with clause 500.
- The dimensional tolerances for shot peened components to be the same as those which have not been shot peened.
- Where the thickness of the material to be shot peened is thin, or the intensity of specified peening finish high, the Contractor to allow for a “balancing” shot peening of Face 2. In addition to the peening of the exposed Face 1. In order to ensure the tolerances of components are maintained.
- The Contractor to complete “Almen strips” during each stage of the work to ensure the completed finish is uniform and consistent with the specified finish to all surfaces.

350 SURFACE CHARACTERISTICS - COVERAGE
- Surfaces shall receive at least 100% coverage by peening media.
- There must be no areas which have not been peened.
- There must be no areas displaying the characteristics resulting from excessive peening.

351 SURFACE CHARACTERISTICS - UNIFORMITY
- Surfaces to have a uniform non-directional finish.
- The Contractor to consider the shape and profile of all components to ensure uniformity between all surfaces of all components.

352 SURFACE CHARACTERISTICS - VISIBLE GRAIN
- There must be no visible grain or 'shadowing' of the stainless steel surface below the shot peening.

353 SURFACE CHARACTERISTICS - COLOUR
- The colour of the surfaces to be consistent when viewed at the same angle to the surface. The surface to be inspected from any viewing angle in any light conditions.

354 SURFACE CHARACTERISTICS - BRIGHTNESS
- The brightness of the surfaces shall be consistent when viewed at the same angle to the surface. The surface shall be inspected from any viewing angle in any light conditions.

355 SURFACE CHARACTERISTICS - CONSISTENCY
- The visual appearance of shot peened surfaces to be consistent between components irrespective of size, shape or profile.

356 SURFACE CHARACTERISTICS - PROFILE
- The surface of shot peened material to have rounded indents. Sharp, angular, or cut indentations are not permitted.
- Shot peened surfaces must not hold or trap dirt or graffiti.

400 AFTER SHOT PEENING
- After the completion of the shot peening, all residual shot to be removed from the shot peened surface in accordance with AMS-S-13165, 3.3.10.1
- After the removal of residual shot the shot peened surface to be chemically cleaned as clause 240.
- After cleaning, all shot peened components to be fully protected from corrosion, contamination or mechanical damage in accordance with the Contractor's statement as clause 220.
- Any process or operations completed after shot peening must not affect full compliance with the requirements of this Specification, including visual appearance, corrosion resistance and avoidance of contamination. Welding, grinding or heat producing activities must not be permitted.

410 PROTECTION OF SHOT PEENING
- All shot peened components to be protected to prevent any mechanical damage by impact or any other means in accordance with the Contractor's statement as clause 220.
- The Contractor to ensure the shot peened surfaces are suitably protected from all potential contaminants such as mild steel dust, cementitious dust, mud and all other deleterious materials throughout the progress of the works in accordance with the Contractor's statement as clause 220.
- All damaged components either by mechanical damage of surface contamination must be rejected.

REMEDIAL WORKS

500 SURFACE REPAIR
- Any damage to or disruption of the surface finish to be restored to comply with the surface characteristics as clause 350 to 356 inclusive.

- The Contractor must not undertake any repairs to shot peened surfaces on site, or in the workshop, without written consent of the CM. All components repaired without consent will be rejected.
- Prior to completing any repairs the Contractor to confirm in writing the nature, area, and location of all areas of damage proposed to be repaired.
- Prior to undertaking any repairs the Contractor to submit for acceptance the specification and method of any proposed repair, including preparation.
- Prior to undertaking any repairs, the Contractor to (in an agreed location) complete a representative trial sample for acceptance of the proposed repair system, method statements, specifications, coating thickness and visual appearance.

QUALITY CONTROL AND TESTING

600 INSPECTIONS
- The Contractor to comply with AMS-S-13165, 4.1
- At any time, and without notice the works may be inspected by the EA to confirm the Contractor's full compliance with the specification.

610 PRE-PEENING INSPECTIONS
- All material to be shot peened must be inspected by the Contractor prior to peening. Confirmation (in writing) of the acceptance of the material and its suitability for shot peening to achieve the specified finish must be issued.

620 COMPLIANCE
- The Contractor to strictly comply with this Specification in accordance with AMS-S-13165, 4.1.1
- Where the Contractor is unable to comply with this Specification he must immediately inform the CM in writing detailing the nature of any areas of non-compliance.

630 SAMPLING
- Intensity determination to be in accordance with AMS-S-13165, 4.2.1.

640 ALMEN STRIPS
- The Contractor to provide at least two Almen strips for each stage of the shot peening process, and at each point where machine requires repositioning or the system requires recalibration.
- Almen strips to be supplied in accordance with AMS-S-13165, 4.2.2.

650 SATURATION CURVE
- A saturation curve to be generated in accordance with AMS-S-13165, 4.2.3.

660 TEST PROCEDURE
- Test procedure to be carried out in accordance with AMS-S-13165, 4.2.4.

670 TESTING SHOT SIZE AND UNIFORMITY
- Tests to be in accordance with AMS-S-13165, 4.3.

680 INSPECTIONS OF SHOT PEENED SURFACES
- After shot peening the Contractor to inspect the works, and issue confirmation in writing of its compliance with this Specification and confirming the anticipated date for delivery to site.
- Prior to delivery to site and at least with one weeks notice, a representative sample of the works to be made available for a thorough visual inspection for compliance with the specified surface characteristics as clause 350 to 356 inclusive in accordance with AMS-S-13165, 6.11
- If the visual inspection reveals components which fail to comply with the specified surface characteristics, all components to be inspected.
- All satisfactory components to be re-protected as clause 410 prior to delivery to site.

690 CORROSION TESTING

- The following samples be tested in a cyclic salt spray test according to BS EN IS0 9227:2006:
- The purpose of the test is to evaluate the corrosion resistance, absence of contamination and visual qualities of the shot peened finish after exposure.
- Prior to testing the Contractor to submit the proposed corrosion testing regime method statement for acceptance.
- 2 No samples of controlled shot peened stainless steel cladding.

END OF SECTION Z35