



# Model Curriculum

## Bearing Maintenance

**SECTOR: IRON & STEEL**  
**SUB-SECTOR: STEEL, SPONGE – IRON, FERRO ALLOYS,  
RE ROLLERS, REFRACTORY**  
**OCCUPATION: MECHANICAL MAINTENANCE**  
**REF ID: ISC/Q0906**  
**NSQF LEVEL: 3**



## Certificate

### CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

**INDIAN IRON AND STEEL SECTOR SKILL COUNCIL**

for the

### MODEL CURRICULUM

Complying to National Occupational Standards of  
Job Role/ Qualification Pack: **'Bearing Maintenance'** QP No. **'ISC/Qo9o6 NSQF Level 3'**

Date of Issuance: **December 22nd, 2015**

Valid up to: **December 21st, 2016**

*\* Valid up to the next review date of the Qualification Pack*

  
Authorised Signatory  
(Indian Iron and Steel Sector Skill Council)



## TABLE OF CONTENTS

<b>1. Curriculum</b>	<b>04</b>
<b>2. Trainer Prerequisites</b>	<b>07</b>
<b>3. Annexure: Assessment Criteria</b>	<b>08</b>

# Bearing Maintenance

## CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Bearing Maintenance”, in the “Iron & Steel” Sector/Industry and aims at building the following key competencies amongst the learner.

<b>Program Name</b>	<b>Bearing Maintenance</b>		
<b>Qualification Pack Name &amp; Reference ID.</b>	<b>Bearing Maintenance ISC/Q0906</b>		
<b>Version No.</b>	1.0	<b>Version Update Date</b>	30-12-2015
<b>Pre-requisites to Training</b>	Minimum qualification – 10 <sup>th</sup> Pass		
<b>Training Outcomes</b>	<b>After completing this programme, participants will be able to:</b> <ul style="list-style-type: none"> <li>Understand the assigned job of bearing maintenance</li> <li>Prepare for bearing maintenance operation</li> <li>Carry out the assigned bearing maintenance operation</li> <li>Use basic health and safety practices at the work place</li> <li>Works effectively with others</li> </ul>		

This course encompasses 5 out of 5 National Occupational Standards (NOS) of “Bearing Maintenance” Qualification Pack issued by “Indian Iron & Steel Sector Skill Council”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	<b>Over view of Iron &amp; Steel Industry</b>  <b>Theory Duration</b> (hh:mm) 04:00 <b>Practical Duration</b> (hh:mm) 00:00  <b>Corresponding NOS Code</b>	<ul style="list-style-type: none"> <li>Understanding Iron &amp; steel industry</li> <li>Understanding types of Iron &amp; Steel Industry</li> <li>Understanding products of Iron &amp; Steel industry</li> <li>Activities in Iron &amp; Steel Industry</li> </ul>	PPTs of Iron and steel manufacturing, Charts showing the same
2	<b>Occupational, Health and Safety (OHAS)</b>  <b>Theory Duration</b> (hh:mm) 08:00 <b>Practical Duration</b> (hh:mm) 06:00  <b>Corresponding NOS</b>	<ul style="list-style-type: none"> <li>Understanding the Occupational health &amp; Safety</li> <li>Understand What is hazard</li> <li>Documentation for Health and safety</li> <li>Working at Heights, confined spaces</li> <li>Remedies for fire at work place</li> </ul>	PPTs for OHAS related to Job Role, Display Material for PPEs related to Job Role, Safety Material

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	<b>Code</b> ISC/N0008		
3	<b>5S &amp; House keeping</b>  <b>Theory Duration</b> (hh:mm) 06:00  <b>Practical Duration</b> (hh:mm) 06:00  <b>Corresponding NOS Code</b> ISC/N0004	<ul style="list-style-type: none"> <li>Identification of bottlenecks in functioning of work place</li> <li>Various methods of housekeeping both pre-work &amp; post-work as well</li> </ul>	PPTs of 5S, Display Charts of 5S, Audit Checklists of 5S
4	<b>Understand the assigned job of bearing maintenance</b>  <b>Theory Duration</b> (hh:mm) 16:00  <b>Practical Duration</b> (hh:mm) 40:00  <b>Corresponding NOS Code</b> ISC/N0929	<ul style="list-style-type: none"> <li>Understand the assigned job of bearing maintenance in accordance with the instructions / checklist</li> <li>Understand the engineering drawings of the equipment for bearing maintenance</li> <li>Seek clarifications with respect to the equipment, drawings, if any</li> <li>Identify the tools, tackles and bearings that are required to carry out the assigned job of bearing maintenance</li> </ul>	PPTs for various types of bearings/drawings, Blue prints, & samples for bearings and respective machines Hand tools and lifting machines, pullers, various measuring instruments
5	<b>Prepare for bearing maintenance operation</b>  <b>Duration</b> (hh:mm) 08:00  <b>Practical Duration</b> (hh:mm) 48:00  <b>Corresponding NOS Code</b> ISC/N0930	<ul style="list-style-type: none"> <li>Reach the site and inspect the equipment for scheduled bearing maintenance and/or defects and identify cause of problem</li> <li>Prepare tools, tackles, spares, material required for bearing maintenance</li> </ul>	Precision measuring tools, pullers, lifting tools etc. marking tools
6	<b>Carry out bearing maintenance operation</b>  <b>Theory Duration</b> (hh:mm) 22:00 <b>Practical Duration</b> (hh:mm) 96:00	<ul style="list-style-type: none"> <li>Conduct routine maintenance or rectify the problem, as appropriate</li> <li>Ensure lubrication of bearings and monitor vibration, temperature using appropriate equipment</li> <li>Conduct tests to ensure fitness</li> <li>Communicate to supervisor about completion of work</li> </ul>	PPTs for various types of bearings/drawings, Blue prints, & samples for bearings and respective machines Hand tools and lifting machines,



Sr. No.	Module	Key Learning Outcomes	Equipment Required
	<b>Corresponding NOS Code</b> ISC/N0931		pullers, various measuring instruments
7	<b>Use basic health and safety practices at the workplace</b>  <b>Duration</b> (hh:mm) 04:00  <b>Practical Duration</b> (hh:mm) 08:00  <b>Corresponding NOS Code</b> ISC/N0008	<ul style="list-style-type: none"> <li>Health and safety procedures</li> <li>Fire safety procedures</li> <li>Emergencies, rescue and first aid procedures</li> </ul>	PPE, Different Type of Safety Sign, First Aid Box, Safety instrument and clothing, Step Ladder, Sample Accident reports, Fire Extinguishers, Items required for fire extinguisher and fire Safety
8	<b>Work effectively with others</b>  <b>Duration</b> (hh:mm) 04:00  <b>Practical Duration</b> (hh:mm) 08:00  <b>Corresponding NOS Code</b> ISC/N0009	<ul style="list-style-type: none"> <li>Ensure appropriate communication with superiors, peers and others as applicable at work place</li> <li>Demonstrate appropriate behaviour and etiquette at work place</li> </ul>	Communication skills PPTs, Posters Team management posters
9	<b>Work effectively with others</b>  <b>Theory Duration</b> (hh:mm) 08:00 <b>Practical Duration</b> (hh:mm) 08:00 <b>Corresponding NOS Code</b> ISC/N0009	<ul style="list-style-type: none"> <li>Ensure appropriate communication with superiors, peers and others as applicable at work place</li> <li>Demonstrate appropriate behaviour and etiquette at work place</li> </ul>	Communication skills PPTs, Posters Team management posters
	<b>Total Duration</b>  <b>Theory Duration</b> 80:00  <b>Practical Duration</b> 220:00	<b>Unique Equipment Required:</b> <ul style="list-style-type: none"> <li>Mechanical Drawings, Blueprints,</li> <li>Basic Tools and Equipment's,</li> <li>measuring tools &amp; precision measurement tools,</li> <li>Assembling tools Lubricant and coolant</li> <li>Material and Equipment for cleaning, Bearing pulling, lifting machines</li> <li>PPE, Safety Sign, First Aid Box, Fire Extinguishers</li> </ul>	



Grand Total Course Duration: **300Hours, 0 Minutes**

(This syllabus/ curriculum has been approved by [Indian Iron and Steel Sector Skills Council](#))

### Trainer Prerequisites for Job role: “Bearing Maintenance” mapped to Qualification Pack: “ISC/Q0906”

Sr. No.	Area	Details
1	<b>Description</b>	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack “ISC/Q0906”.
2	<b>Personal Attributes</b>	Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in the mentioned field.
3	<b>Minimum Educational Qualifications</b>	Min. ITI Fitter pass and preferably CTI/ATI cleared/ Diploma Mechanical
4a	<b>Domain Certification</b>	Certified for Job Role: “ <u>Bearing Maintenance</u> ” mapped to QP: “ISC/Q0906”. Minimum accepted score is 80%
4b	<b>Platform Certification</b>	Recommended that the Trainer is certified for the Job Role: “Trainer”, mapped to the Qualification Pack: “SSC/1402”. Minimum accepted score is 80%
5	<b>Experience</b>	Min. 5 years industry experience and minimum 2 years’ experience as Trained or un trained for same Job Role/ Trade



## Annexure: Assessment Criteria

<b>Assessment Criteria</b>	
<b>Job Role</b>	<b>Bearing Maintenance</b>
<b>Qualification Pack</b>	<b>ISC/Q0906</b>
<b>Sector Skill Council</b>	<b>Indian Iron &amp; Steel Sector Skill Council</b>

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on these criteria.
5	To pass the Qualification Pack, every trainee should score a minimum of 60% in every NOS.
6	In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

Assessment outcome (nos)	Assessment criteria	Marks allocation			
		Total marks	Out of	Theory	Skills practical
<b>ISC/N0929: Understand the assigned job of bearing maintenance</b>	PC1. Interpret the checklist and understand the bearing maintenance job requirements	<b>250</b>	15	5	10
	PC2. Identify classifications of bearings e.g. single row radial ball bearing, roller bearing, angular contact ball bearing, self aligning bearing, special bearing races, cylindrical roller bearing, single/double row tapered roller bearing, thrust bearing etc.		20	5	15
	PC3. Understand the cleaning procedure of bearing and related parts		15	5	10





Assessment outcome (nos)	Assessment criteria	Total marks	Out of	Marks allocation	
				Theory	Skills practical
	PC4. Understand the dimensions and related parts of bearing		10	0	10
	PC5. Plan, as appropriate to carry out the bearing maintenance job		15	5	10
	PC6. Understand sections, views, scale of measurement used in the engineering drawing of the equipment		15	5	10
	PC7. Understand the symbols used in the engineering drawings		15	0	15
	PC8. Understand other specifications and identify the sequence of activities required for bearing maintenance/changing		15	5	10
	PC9. Read and interpret engineering drawings to ensure correct limits, tolerance and fits of bearings		15	0	15
	PC10. Identify any clarifications that he wants to seek with respect to the given equipment drawing		15	0	15
	PC11. Identify and seek clarifications with respect to bearings with all related parts		15	5	10
	PC12. Recognise whom to contact for clarification on engineering drawings		10	0	10



Assessment outcome (nos)	Assessment criteria	Marks allocation		Theory	Skills practical
		Total marks	Out of		
	PC13. Escalate the concern to the supervisor or shift-in-charge, if needed		15	5	10
	PC14. Identify tools, tackles & equipment (lifting equipment, various sizes of spanner, dial gauge, Venire calliper, filler gauge, torque range, bearing heating furnace etc.) required to perform the bearing maintenance operation		15	5	10
	PC15. Identifying the different types of bearings for maintenance and changing		15	5	10
	PC16. Ask helper to carry tools required to the desired work site		15	5	10
	PC17. Report to stores / supervisor in case of non-availability of tools & tackles or stock-out of spares		15	5	10
	<b>NOS Total Marks</b>	<b>Total</b>	<b>250</b>	<b>60</b>	<b>190</b>
<b>ISC/N0930: Prepare for bearing maintenance operation</b>	PC1. Reach the site with desired tools, tackles and equipment	<b>200</b>	15	5	10
	PC2. Plan for job duration and understand the process as per SOP		15	5	10
	PC3. Arrange necessary instruments to carry out maintenance (dial gauge, spirit level, vibration measuring instrument and tools for dismantling and assembling e.g. spanners,		15	5	10



Assessment outcome (nos)	Assessment criteria	Marks allocation			
		Total marks	Out of	Theory	Skills practical
	torque wrench, power tools etc.)				
	PC4. Identify the root cause of the problem, if any (radial run out of assemble bearing, face run out with race way, face run out with bore, race way parallel with face, outside face inclination and thickness variance)		15	5	10
	PC5. Identify and collect bearings as per drawing		15	5	10
	PC6. Plan for storage of new bearing and old bearing at job site		15	5	10
	PC7. Ensure not to store multiple bearings on top of each other		15	5	10
	PC8. Ensure not to store large bearings in upright position		15	5	10
	PC9. Understand the hazardous area of work and necessary precautions to be taken to execute the job as well as safe handling of equipments		15	5	10
	PC10. Prepare tools, tackles, the list of spares (lifting equipment, various sizes of spanner, dial gauge, Venire calliper, filler gauge, torque range, bearing heating furnace etc.) required for completion of bearing maintenance/change job and ensure availability at work site		20	5	15
	PC11. Ensure that tools and tackles match the standard specifications		15	5	10



Assessment outcome (nos)	Assessment criteria	Marks allocation	
		Total marks	Out of
	PC12. Ensure tools, tackles and equipment required for assembly are free from physical damage and ready for bearing maintenance/changing operation		15
	PC13. Report damaged / defective components of equipment and bearings as per the escalation matrix		15
	<b>NOS Total Marks</b>	<b>Total</b>	<b>200</b>
<b>ISC/N0931: Carry out the assigned bearing maintenance operation</b>	PC1. Interpret the SOP and plan for handling the parent equipment, dismantling, assembling of bearing	<b>100</b>	15
	PC2. Understand the checklist and ensure all assembly check points are measured and correctly recorded		15
	PC3. Dismantle the equipment, as needed for bearing maintenance and changing activities		10
	PC4. Correct the defects in the bearing or replace the defective bearing		15
	PC5. Assemble the bearing related parts according to the drawings		10
	PC6. Fasten mechanical components/ subassemblies together using screws, bolts, and collars using hand/ power tools for bearing replacement		10
	PC7. Set and adjust linkages, tensions and clearances of assembled components to specification using gauges and hand tools		10
	PC8. Re assemble the bearing related parts post correcting the defect		15



Assessment outcome (nos)	Assessment criteria	Total marks	Out of	Marks allocation	
				Theory	Skills practical
	PC9. Understand and ensure all necessary steps are completed before start-up of the machine		10	0	10
	PC10. Identify and use appropriate vibration and temperature measuring instruments		15	5	10
	PC11. Understand different types of bearings (anti friction, frictional bearing and their classification) the procedure of lubrication		15	5	10
	PC12. Assemble, dismantle and measure gaps of different anti friction bearings e.g. ball bearing, roller bearing, taper roller bearing etc.		15	5	10
	PC13. Assemble, dismantle and measure gaps of Babbitt bearing		15	5	10
	PC14. Understand and conduct hand scraping of Babbitt bearing		10	0	10
	PC15. Ensure lubrication of bearings prior to starting use of equipment		15	5	10
	PC16. Record and monitor that temperature and vibration are at desirable levels		15	5	10
	PC17. Identify any deviations from desirable levels and take necessary actions to correct them		15	5	10
	PC18. Ensure alignment of bearing related parts and with the engineering drawings		15	5	10
	PC19. Check bearing vibrations to ensure they are within desired limits		10	0	10



Assessment outcome (nos)	Assessment criteria			Marks allocation	
		Total marks	Out of	Theory	Skills practical
	PC20. Test the machine to ensure it is fit to use before handover		10	0	10
	PC21. Record the test results in the prescribed format of the organization		15	5	10
	PC22. Ensure all activities are complete according to checklist		15	5	10
	PC23. Communicate to supervisor on completion of given job and/or in case of any deviations from checklist		10	0	10
	<b>NOS Total Marks</b>	<b>Total</b>	<b>300</b>	<b>70</b>	<b>230</b>
<b>ISC/N0008: Use basic health and safety practices at the workplace</b>	PC1. Use protective clothing/equipment for specific tasks and work conditions	<b>150</b>	9	4	5
	PC2. State the name and location of people responsible for health and safety in the workplace		6	1	5
	PC3. State the names and location of documents that refer to health and safety in the workplace		2	1	1
	PC4. Identify job-site hazardous work and state possible causes of risk or accident in the workplace		8	4	4
	PC5. Carry out safe working practices while dealing with hazards to ensure the safety of self and others state methods of accident prevention in the work environment of the job role		6	1	5
	PC6. State location of general health and safety equipment in the workplace		6	1	5



Assessment outcome (nos)	Assessment criteria	Total marks	Out of	Marks allocation	
				Theory	Skills practical
	PC7. Inspect for faults, set up and safely use steps and ladders in general use		6	1	5
	PC8. Work safely in and around trenches, elevated places and confined areas		6	1	5
	PC9. Lift heavy objects safely using correct procedures		6	1	5
	PC10. Apply good housekeeping practices at all times		2	1	1
	PC11. Identify common hazard signs displayed in various areas		6	5	1
	PC12. Retrieve and/or point out documents that refer to health and safety in the workplace		5	1	4
	PC13. Use the various appropriate fire extinguishers on different types of fires correctly		9	4	5
	PC14. Demonstrate rescue techniques applied during fire hazard		8	4	4
	PC15. Demonstrate good housekeeping in order to prevent fire hazards		2	1	1
	PC16. Demonstrate the correct use of a fire extinguisher		6	1	5
	PC17. Demonstrate how to free a person from electrocution		6	1	5
	PC18. Administer appropriate first aid to victims as required e.g. in case of bleeding, burns, choking, electric shock,		8	3	5



Assessment outcome (nos)	Assessment criteria	Total marks	Out of	Marks allocation	
				Theory	Skills practical
	poisoning etc.				
	PC19. Demonstrate basic techniques of bandaging		6	1	5
	PC20. Respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		7	2	5
	PC21. Perform and organize loss minimization or rescue activity during an accident in real or simulated environments		6	1	5
	PC22. Administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases		6	1	5
	PC23. Demonstrate the artificial respiration and the CPR Process		6	1	5
	PC24. Participate in emergency procedures		6	1	5
	PC25. Complete a written accident/incident report or dictate a report to another person, and send report to person responsible		4	1	3
	PC26. Demonstrate correct method to move injured people and others during an emergency		2	1	1
	<b>NOS Total Marks</b>	<b>Total</b>	<b>150</b>	<b>45</b>	<b>105</b>





Assessment outcome (nos)	Assessment criteria	Marks allocation			
		Total marks	Out of	Theory	Skills practical
<b>ISC/N0009: Work effectively with others</b>	PC1. Accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required	<b>100</b>	10	5	5
	PC2. Accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt		10	5	5
	PC3. Provide information to others clearly, at a pace and in a manner that helps them to understand		10	0	10
	PC4. Display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible		10	5	5
	PC5. Consult with and assist others to maximize effectiveness and efficiency in carrying out tasks		10	5	5
	PC6. Display appropriate communication etiquette while working		10	0	10
	PC7. Display active listening skills while interacting with others at work		10	0	10
	PC8. Use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism		10	5	5
	PC9. Demonstrate responsible and disciplined behaviors at the workplace		15	5	10
	PC10. Escalate grievances and problems to		5	0	5



Assessment outcome (nos)	Assessment criteria	Total marks		Marks allocation	
		Total marks	Out of	Theory	Skills practical
	NOS Total Marks	Total	100	30	70
	Grand Total	1000	1000	270	730
	Percentage Weightage:			50%	50%
	Minimum Pass% to qualify (aggregate):			60%	