



## **Bureau of Indian Standards**

1	Action Research Project No	AR/232
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3	Deptt & Place of Posting	DLBO-II
4	Title for standard in review	IS 11071 : Part 2 : 1984 - Specification for inset type aerodrome lighting fittings: Part 2 runway centre line lighting fittings
5	Technical Committee	ETD 49
6	Name & Designation of member secretary	Sh Shyam Kumar, Scientist C, ETD
7	Date of Allocation of the review	15-03-2021

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## **1. Timeline:-**

<b>Sr no.</b>	<b>Date/Duration</b>	<b>Work done</b>
<b>1.</b>	15th Mar 2021	ARP allotted
<b>2.</b>	15th Mar - 1st May 2021	Literature Survey, Questionnaire preparation and circulation
<b>3</b>	6th May 2021	Virtual Meeting with Sh S K Paliwal, Technical Director at Vardhman Airport Solutions
<b>4</b>	18th May 2021	Review of ARP assigned with DG, BIS
<b>5</b>	25th May 2021	Virtual Meeting with Sh N B Goel, JGM, AAI
<b>6</b>	17th June 2021	In-person meeting at Vardhman Airport Solutions factory with Sh Sushim Jain (Director), Sh Vidya Dutt (Associate Director), Sh S K Paliwal (Technical Director)
<b>7</b>	8th - 9th July 2021	Visit to Jaipur International Airport
<b>8</b>	9th July - 30th Aug 2021	Project report and Draft Standard Preparation

## **2. Literature survey:-**

### **a. Assistance standards/Documents and their status:**

<b><u>Sr.No</u></b>	<b><u>Standard/Document</u></b>	<b><u>Version mentioned in IS 11071:1984</u></b>	<b><u>Current version</u></b>
1	International standards and recommended practices - Aerodromes Annex 14, International Civil Aviation Organization (ICAO)	1976. 7th Edition	2018. 8th Edition
2	Aerodrome design manual: Part 4 Visual aids. Ed 1. 1976, International Civil Aviation Organization (ICAO)	1976. 1st Edition	2004. 4th Edition
3	Federal Aviation Agency Advisory circular No. 150/5345-46	1975	2016

**b. Referred standards and their status**

<b><u>Sr. No</u></b>	<b><u>Standard/Document</u></b>	<b><u>Version mentioned in IS 11071:1984</u></b>	<b><u>Current version</u></b>
1	Rules for rounding off numerical values	IS 2:1960	Additional 3 Amendments
2	Electrotechnical vocabulary: Part 16 Lighting, Section I General aspects.	IS: 1885 (Part 16/Sec 1 )-1968	No Changes
3	Electrotechnical vocabulary: Part 16 Lighting, Section 2 General illumination, lighting fittings and lighting for traffic and signaling.	IS : 1885 (Part 16/Set 2 )-1968	No Changes
4	Specification for elevated type aerodrome lighting fittings: Part 1 General Requirements	IS : 7785 (Part 1)-1975	No Changes
5	Electroplated coatings of cadmium on iron and steel (first revision).	IS : 1572-1968	IS 1572: 1986 (Second Revision) (Amendment 1)
6	Electroplated coatings of zinc on iron and steel (first revision )	IS : 1573- 1970	IS 1573: 1986 Specification for electroplated coatings of zinc on iron and steel (Second Revision)
7	Methods for determination of weight of zinc coating on zinc coated iron and steel articles	IS : 6745-1972	5 Amendments circulated
8	Basic environmental testing	IS : 9000( Part 4)-1979	Withdrawn, IS

	procedures for electronic and electrical items: Part 4 Damp heat (steady state).		9000 (Part 4)-2020 / IEC 60068-2-78 : 201 (Second revision) is currently in use
9	Basic environmental testing procedures for electronic and electrical items: Part 11 Salt mist test.	IS : 9000 ( Part 11)-1983	No changes
10	Part 16 Driving rain test	IS : 9000 ( Part 16 )-1983	No changes
11	Part 12 Dust Test	IS : 9000 (Part 12)-1981	No changes
12	Specification for inset type aerodrome lighting fittings part 1 general requirements and tests	IS : 11071 ( Part 1) - 1984	Part 1 of this standard

In addition to this, following standards and documents were studied

- IEC 61827 1st Edition 2004-05
- Tenders floated by AAI

### c. Questionnaire:

After comparison between IS and Other International Standards, following questionnaire was prepared and shared with the manufacturer and consumer

<u>Sr No</u>	<u>IS clause</u>	<u>IS 11071 (Part 1): 1984 statement</u>	<u>AC statement</u>	<u>Advisory Circular Clause</u>	<u>Query</u>
1	3.1	System voltage should not be greater than 50 V dc or ac (rms) to earth.	-	-	IS it still applicable?
2	3.2.1	Temp range from -20°C to +55°C	Operating temp range - 40° to +55 °C	3.2 (1)	comments if any changes are required in this clause
2.1	3.2.2	Altitude requirement	Not mentioned in AC		comments if any changes are required in this clause
3	8.2	IS 11071 (Part 2): 1984 mention the requirement of 13.00 mm for projection of the lights above the ground	- Avg roughness of gasket – 1.62 um - all edges that project above the pavement must be rounded to not	3.10.1.2	Comments, if the requirements need to be added in the IS

			less than 1.59 mm radius		
3.1	8.3	Quality of stainless steel not mentioned	Detailed quality requirements are given	3.10.1.1	Comments, if the requirements need to be added in the IS
4	8.4	Hold-down bolts shall be hexagonal head type.	No such requirement stated	-	comments if any changes are required in this clause
5	11.4.2 & 11.4.3	Insulation resistance > 100 Mohm	IR > 50Mohm	4.5.5	comments if any changes are required in this clause
6	11.7	Temperature requirement of low temp test is -20±2°C	The same requirement is -40°C	4.6.2	comments if any changes are required in this clause
7	11.10.1	Leakage Test  This test must be performed after the assembled light fixture has successfully passed the static load test.	This test must be performed after the assembled light fixture has successfully passed the vibration test, impact test, hydraulic impact test, and load test.	4.5.3.2	comments if any changes are required in this clause



8	11.12	Horizontal Static Load Test	No such test mentioned in AC	-	comments if any changes are required in this clause
9	11.14	Zinc and cadmium covering requirements	Only zinc plating is mentioned	4.5.6	comments if any changes are required in this clause
10	11.15	Lamp bypass Test	No such test mentioned in AC	-	comments if any changes are required in this clause
11	11.16	No such requirement mentioned in IS. Also, no passing criteria mentioned in either IS	Weight of the heavy vehicle is 2721 kg.	4.5.2.3	comments if any changes are required in this clause
12	11.17	Humidity Test and its test method	No such test mentioned in AC	-	comments if any changes are required in this clause
13	Appendix A of IS 11071 Part 2	Photometric requirements mentioned are different in both standards.	--	Table 1 of AC	comments if any changes are required in this clause
14	-	-	Method of mounting is not given in IS	3.4.1.1 & 3.4.1.2 of AC	comments if any changes are required in this clause

15	-	-	Mechanical impact clause not mentioned in IS	3.5.5	comments if any changes are required in this clause
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The questionnaire was circulated with manufacturers and consumers (AAI). The Conclusion section of this report is based on their inputs.

### **3. Interactions with stakeholders and Feedback / Comments Obtained**

#### **a. Manufacturer**

##### **i. VC with Technical Manager of Vardhman Airport Solutions**

- Video conference meeting with Technical Manager of Vardhman Airport Solutions, Sh S K Paliwal was held on 6th May 2021
- The questionnaire was provided to them prior to the meeting and clause wise discussion was held. Remarks obtained are tabulated in the Conclusion section of this report.
- Major manufacturers of this product are American, European and Korean. However, American and European markets are saturating. So, their focus is now shifting on Africa and Asia; which holds promising potential for this market.
- In India, there are two major manufacturers / suppliers of this product. Namely, Vardhman Airport Solutions and AMA (Airfield Lighting Solutions). Inset lighting is primarily imported and supplied to Indian Airports
- FAA, ICAO standards are followed mainly for testing and specifications.
- Advice to study ICAO Annex 14, ICAO Aerodrome design manual Part 4 and 5 for a better understanding.

##### **ii. Meeting with Managers of Vardhman Airport Solutions**

- In-person meeting with Managers of Vardhman Airport Solutions, Sh Sushim Jain, Sh Vidya Dutt , and Sh S K Paliwal on 17th June 2021.
- IS 11071 (Part 1, 2, and 4) was discussed clause wise. The technical remarks obtained during the meeting are tabulated in the Conclusion Section of this report
- As the tenders of these lightings mentions requirements as per FAA (American Standard) and ICAO Annex 14, the product needs to get tested in foreign labs as no labs are available in India to do the testing. Various practical problems such as delay in testing, huge testing charges etc. are associated with this challenge.
- LEDs are being introduced in place of halogen lamps in the runway lightings. As the testing requirements and specifications for the LED

lights are different from the halogen lamps, a separate standard needs to be formulated for the Runway Lighting Incorporating LED lights.

- Various old Indian Standards such as IS 7785: 1976, IS 12290: 1987 etc. need to be revised as they are old standards and introduction of new technology has made them obsolete. These standards are listed in the recommendation section of this report.

## **b. Consumer (AAI)**

### **i. VC with manager in AAI**

- A video conference meeting with Sh N B Goel (JGM (Engg-E), AAI) was held on 25th May 2021
- The questionnaire and feedback obtained from the manufacturer was shared with them prior to the meeting.
- Remarks and Feedbacks obtained from them are tabulated in the Conclusion Section of this report.
- Discussion was also held regarding tenders issued by AAI for inset aerodrome lighting. As the Indian Standard is old, specifications as per the foreign standards are mentioned in the tenders. If the IS gets revised, IS and DGCA guidelines should constitute the specifications required for the aerodrome lighting.
- To get a better understanding of the subject, he invited us to visit Jaipur International Airport to study the installation and maintenance of the inset runway lighting and have a practical exposure to newer technologies being incorporated.

### **ii. Visit to Jaipur International Airport**

- Following is the visit report for visit to Jaipur International Airport.
- We visited the Jaipur International Airport on 8th and 9th July 2021 to study installation and maintenance of Inset Runway Lighting as per IS 11071 (Part 1, 2, and 4)
- On 8th of July, we met Mr. Ved Bhushan (Manager) at Engineering Office of AAI, who inducted us with the working of AAI and Jaipur Airport, understood our purpose of visit and was with us the whole day during the visit giving us the input and elaborating various technical aspects related to our project.
- Later, we met Mr. R K Yadav (Astt. General Manager), who was keenly interested in the runway lighting project that we were assigned and promised to give his suggestions regarding the different clauses of

the standard. Mr. Yadav and Mr Ved Bhushan made arrangements for our airport gate pass.

- We had a once in a lifetime opportunity to see runway lighting and take firsthand experience of its installation and maintenance. We met Mrs. Sakshi (JE) and Mr Mangelal (JE) who explained to us the installation and maintenance of the lighting. We visited the runway during the NOTAM timing where we saw the complete circuitry including isolating transformers, Automatic Switching Drives (ASDs) of inset as well as elevated lights.
- We also had an opportunity to see the operation of ILCMS (Individual Lighting Control and Monitoring System) by which the status of every light is monitored and controlled through the control room. CCR along with the UPS, DG sets and battery backups were also installed in the same place and the whole circuitry was thoroughly explained to us.
- On 9th of July, We met Mr R K Yadav again and discussed the whole standard IS 11071 (Part 1, 2 and 4) in detail and took his suggestions in the clauses in which revision of the standard is required. He also showed us the samples of photometric data of the tests conducted on the runway lights as per the maintenance schedule and how the conclusions are drawn from the results.

#### 4. Conclusion

Sr No	IS	Clause	Point of Discussion	Remark by Manufacturer	Remarks by Consumer	Action Taken / Conclusion
1	11071 (Part 1, 2 and 4)	0.5 (of part 1 and 4), 0.6 (of part 2)	--	Latest editions of International standards from which assistance has been taken need to be incorporated	-	In the working draft of the standard, newer versions of the International Standards have been included.
2	11071 (Part 1)	3.1	The requirements of the fitting has been mentioned as for AC as well DC systems	Even though AC systems are used worldwide, provision of DC systems in the standard should be kept	--	Clause is being kept as is in the standard.
3	11071 (Part 1)	3.2.1	Temperature requirement in IS has been mentioned as -	If the international standard requirements	Current temperature requirement	The temperature requirement in the clause is being kept the same while adding the suggestion given

			20°C to 55°C, but international standard mentions the same as -40°C to 55°C	need not to be incorporated directly as Indian weather conditions are not that extreme. An atmospheric data to be studied and the temperature requirements are to be incorporated	ts are suitable for most of the Indian Airports. For airports having extreme weather, agreement between manufacturer and purchaser can be made.	by the consumer.
4	11071 (Part 1)	3.2.3	Humidity range has been specified as 10 to 100%	Max humidity requirement should be $96 \pm 2\%$	--	The humidity requirement has been changed in the draft as per the manufacturer's suggestion as there exists a Humidity Test (Type Test) which shall be withstood by the light
5	11071	4.1	-	A keyword " lamp holder	agreed	The keyword has been incorporated in the working draft

	(Part 1)			(holder can be a part of the lamp)” need to be included		of the standard
6	11071 (Part 1)	6.7	-	The practice of using the adapter rings is no longer used. The ring parameters should be defined or the provision should not be allowed at all	Shallow base is replaced every time when the recarpating is done. The rings are not used anywhere	As per the suggestions by manufacturer and consumer, the requirement has been made as optional in the draft standard.
7	11071 (Part 1)	8.3	International standards mention the grade of steels to be used while making the hold down bolts, nuts and washers. In IS; ‘ best quality of	‘Best quality’ wording is too subjective. This requirement should not be mentioned in the standard as this pertains to manufacturer’s wits as long as	--	The word ‘best’ has been omitted in the draft standard and the sentence has been replaced as ‘All hold-down bolts, nuts and washers shall be corrosion resistant.’



			stainless steel shall be used' has been written	the product passes in all the requirements tested.		
8	11071 (Part 1)	11.4.2 and 11.4.3	Insulation resistance > 100 Mohm while the international standards have IR requirements of > 50 Mohm	Insulation resistance is very much greater than 100 Mohm. This clause in the IS can be kept the same	agreed	The clause has been kept same in the working draft
9	11071 (Part 1)	11.10.1	Requirement in the IS for the Leakage test mentions 'This test must be performed after the assembled light fixture has successfully passed the static load test.'	This test must be performed after the assembled light fixture has successfully passed the vibration test, impact test, hydraulic impact test, and load test.	agreed	The suggestion given by the manufacturer has been incorporated in the draft standard
8	11071	11.14	-	The clause is	agreed	Suggestion of the manufacturer is

	(Part 1)			outdated. 'If applicable' wording should be incorporated in this clause		being incorporated in the working draft.
9	11071 (Part 1)	11.15	-	Lamp bypass arrangement is not incorporated anywhere in the world. The clause is outdated. A separate isolating transformer is installed for each light	agreed	This test is being made as an optional test in the working draft.
10	11071 (Part 1)	11.16	Weight is heavy vehicle has not been mentioned in the IS. FAA standard mention the weight of the heavy vehicle	Requirement mentioned in the FAA can be included in IS	agreed	The weight of heavy vehicle is being included in the working draft.

			as 2721 kg			
11	11071 (Part 2)	4.2	Projection of the lighting assembly has been given as 13.00 mm (Max) in IS and 12.00 mm (Max) in FAA	Practically, the projection is not more than 6 - 8 mm. 12.00 mm requirement is acceptable.	agreed	The requirement has been reduced to 12.00 mm in the draft.
12	11071 (Part 2 and 4)	Appendix A	-	Photometric Diagrams should also contain grids.	agreed	The requirements regarding the same have been mentioned in DGCA regulations for Airport Design and Operation. The appendix has been modified according to the regulations and incorporated in the working draft.

## 5. Recommendation

- a. A separate standard may be formulated for LED lamps being used in Runway Inset Type Lighting systems as the test requirements and specifications for LED lights are different from that of Halogen lamps. Assistance for formulating this standard can be drawn from the latest editions of Federal Aviation Agency (FAA) Advisory Circulars, and ICAO Design Manual Part 4 and 5 and Annex 14. Currently, IS 8901: 1978 has scope for tungsten filament type lamps being used in aerodrome lighting.

- b. Many Indian Standards which are important for aerodrome lighting need to be revised incorporating the technological changes. The standards are tabulated below

<b>Sr No</b>	<b>IS Number</b>	<b>IS Name</b>
1	IS 7785 (Part 1): 1975, IS 7785 (Part 2, 3): 1976, and IS 7785 (Part 4,5,6): 1981	Specifications for Elevated Type Aerodrome Lighting Fittings
2	IS 12290: 1987	Specification for isolating transformers for airport lighting systems
3	IS 12291: 1987	Specification for constant current regulators for airport lighting systems