FAA-STD-008
Amendment-1
April 3, 1968

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
STANDARD

SITING AND INSTALLATION STANDARDS FOR
RUNWAY VISUAL RANGE EQUIPMENT FOR CATEGORY I AND II OPERATION

This amendment forms a part of FAA-STD-008 dated May 19, 1967.

Page 3, Chapter 2, paragraph 3: Delete and insert the following:

3. ESTABLISHMENT GUIDE

a. Establishment.- The establishment of an RVR facility shall be based on criteria contained in the appropriate planning standard.

b. Baseline considerations.- The following baseline considerations are to apply to locations at which RVR systems are to be established.

(1) For purposes of standardization all new transmissometer locations shall be installed on a 250 foot baseline for use under Category I and II conditions.

(2) When a Category I runway is upgraded to a Category II runway, the rollout transmissometer shall be installed on a 250 foot baseline. The existing touchdown transmissometer may be left on a 500 foot baseline. If the existing touchdown transmissometer is also to be used to provide rollout information for aircraft landing in the opposite direction, the transmissometer shall be relocated from the 500 foot baseline to a 250 foot baseline. Otherwise, the 500 foot baseline may be retained.

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FAA-STD-008
May 19, 1967

DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION STANDARD

SITING AND INSTALLATION STANDARDS

FOR

RUNWAY VISUAL RANGE EQUIPMENT

FOR CATEGORY I AND II OPERATION

FOREWORD

Standardized siting and installation procedures for Runway Visual Range equipment are required to assure comparability of RVR data obtained at different locations.

Because this information is used by Weather Bureau personnel as well as by aviation interests, it is important that standardized techniques be utilized.

The criteria stated in this standard are compiled from or are in consonance with previously established Weather Bureau criteria contained in Chapter C-2 Transmissometer Facilities Installation, and National Bureau of Standards Reports Instruction Book for Transmissometer Set AN/GMQ-10. The use of these documents is acknowledged with appreciation.

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CHAPTER 1. GENERAL

1. SCOPE. This standard sets forth siting criteria and installation standards for Runway Visual Range (RVR) equipment to be installed at airports designated for Category I and Category II operations.

2. DEFINITION.

RVR. Runway Visual Range is an instrumentally derived value, based on standard calibrations, that represents the horizontal distance a pilot will see down the runway from the approach end or at the rollout end. It is based on the sighting of either high intensity runway lights or on the visual contrast of targets whichever yields the greater visual range.

CHAPTER 2. CRITERIA

3. ESTABLISHMENT GUIDE.

a. One RVR system shall be installed at the touchdown end of the runway at all Category I and II installations. This equipment is presently installed by the Weather Bureau on a 500 foot baseline. Where an initial installation of the RVR transmissometer, consisting of a projector and receiver, is being made on the approach end of a Category II runway, it shall be installed on a 250 foot baseline. At a Category I installation, it may be installed on either a 250' or 500' baseline. Consideration shall be given to possible future utilization of the Category I runway in determining the baseline.

b. One RVR system shall be installed at the rollout end of the runway at all programmed Category II installations. This equipment shall be installed on a 250 foot baseline. Where possible, the rollout end RVR system may also serve as the approach RVR system of another ILS runway.

4. SITE SELECTION.

a. General.

(1) The transmissometer measures the transmissivity of the sample of air in the path between the projector and the receiver. It is essential that the instruments be located so that the sample measured is representative of the general runway area for which visibility information is required.

(2) Site selection will be performed by Airway Facilities and coordinated with the representatives of the appropriate Weather Bureau Office and the Flight Standards Office to assure that their requirements are satisfied.

b. Basic Optical Considerations. The following principles will serve as a guide for siting where siting options exist:

(1) Terrestrial backgrounds seen by the receiver are generally better than sky backgrounds.

(2) Nearby terrestrial backgrounds are better than distant terrestrial backgrounds.

(3) When nearby objects form the background, the preferred orientation of the line of sight from the receiver to the projector is southerly. If this background has a low reflectance any orientation will be satisfactory.

(4) When the receiver "sees" a sky background or a distant terrestrial background behind the projector, the preferred orientation of the line of sight from the receiver to the projector is within 45° of north.

(5) Directions within 25° of east or west should be avoided whenever possible.

(6) Orientation of the baseline so that objects having high reflectance, such as white buildings, are within one degree of the line of sight should be avoided.

(7) Orientation of line of sight should be chosen so that projector light will not produce glare in critical areas. Because of narrow beam spread, little glare will be produced at angles of 5° or more from the line of sight.

(8) The receiver should be positioned so that it "sees" a terrestrial or dark background. Direct rays from the sun should never fall upon the lens. Since the lens is protected by a long narrow tube such interference can only occur near sunrise or sunset. If during these periods these conditions exist, the addition of a 4-foot square, black sheet metal shield placed behind the projector usually prevents interference from the sun. Additionally, this shield reduces glare or reflection, from light colored backgrounds that may reach the lens.

c. Basic Functional Considerations. The following factors should be considered:

(1) Locate the projector and receiver on the side of the runway corresponding to the direction from which the "obstructions to vision" such as fog, haze, dust most frequently come.

(2) Do not locate the projector and receiver in a low place where "obstructions to vision" are trapped.

(3) Do not locate the projector and receiver on a high place from which "obstructions to vision" will be swept away by the slightest breeze.

(4) Locations near sources of contamination such as vents, stacks, etc., which channel the flow of contamination shall be avoided whenever possible. These locations frequently produce an atmospheric condition which is not typical of the landing area visibility.

(5) Locations near bluffs, sharp grades, etc., shall be avoided since turbulence and temperature changes will frequently produce a non-representative condition.

d. Preferred Location of Transmissometer at Touchdown End of Runway.

The projector is to be placed near the glide slope building and the receiver 250 feet away toward the direction of aircraft approaching the ILS runway. Neither unit shall be closer than 400 feet of center line of runway or closer than 150 feet of center line of taxiway. An angle of 14.5° is maintained between the center line of the runway and the baseline between projector and receiver. The beam shall be directed away from the runway. Neither unit may be placed within the glide slope building restricted area. Caution shall be taken to assure that transmissometers do not interfere with glide slope accuracy. Airway Facility personnel and flight inspection personnel should be consulted on siting and possible interference. Refer to Figure 1 for siting information. It will be noted that this Figure gives alternate locations of the transmissometer. The transmissometer position which is selected shall meet the requirements of this standard. Note paragraph 4(h) of this section which deals with restrictions to be observed in transmissometer siting.

e. Preferred Location of Transmissometer at Rollout End of Runway

(Applicable to Category II runways only). This second system is to be installed with the projector 1000 feet from the rollout end of the runway and 400 feet from the center line of the runway with the receiver at an angle of 14.5° away from the runway center line toward the direction of the aircraft approaching the ILS runway. Baseline is 250 feet.

f. Alternative Locations. If it is not practical to install the transmissometer as required above, the site selected should be one that will be as representative as possible of meteorological conditions over the adjacent runway. The dimension of 1000 feet (applicable to the rollout system) from the end of the runway for the projector may be moved back an additional 1500 feet if required by intersecting runway, taxiways, etc., in order to maintain the clearance from the runway.

g. Dual Ended Runways. Where a runway has two localizers and two glide slopes (two approach and two rollout ends) only two transmissometers will be installed. One system will be installed at each end of the runway. Each system will be established on a 250 foot baseline. Criteria regarding glide slope and localizer critical areas will be observed. The projector shall face in the direction of aircraft approaching the primary runway.

h. Restrictions. Figures 1 and 2 detail the restrictions that apply to siting the projector and receiver at the approach and rollout end of the runways. The pertinent restrictions follow:

(1) Structures shall not exceed 15 feet in height above the elevation of the runway centerline nearest them and in addition shall be no closer to the runway centerline than 400 feet (Appendix 3, paragraph 7b(3), AC No. 120-20 6/6/66).

(2) Structures shall be no closer than 150 feet to the center line of a taxiway.

(3) Structures shall not be placed in the glide path critical area which is a rectangular area extending from the glide slope transmitting antenna to:

(a) One thousand feet in the direction of the approach end or to the end of the runway, whichever is greater.

(b) Zero feet in the opposite direction.

(c) The near edge of the runway which the ILS serves.

(d) One hundred and seventy-five feet in the direction away from the runway.

(4) Structures shall not be placed in a rectangular area extending from the localizer transmitting antenna 1000 feet in the direction of the approach end of the runway and 200 feet on either side of the runway center line.

(5) The projector and the receiver at the approach end shall be no further than:

(a) One thousand feet from the center line of the runway. The optimum location of the transmissmeter is 400 feet from the runway centerline. When a transmissmeter is to be located more than 500 feet from the runway centerline, Flight Standards Service shall be notified in writing of the proposed location and the reason for placing the transmissmeter beyone 500 feet. A copy of the correspondence shall be addressed to the Systems Research and Development Service, Attention: RD-400.

(b) One thousand feet from the Reference Control Point (RCP) toward the approach end of the runway.

(c) One thousand and five hundred feet away from the RCP down the runway.

NOTE: Reference Control Point (RCP) is defined as the intersection of the center line of the runway with a perpendicular intercept through the glide slope building.

5. HEIGHT OF TRANSMISSOMETER ELEMENTS. Identical requirements apply to the touchdown and rollout transmissometer. They shall be placed (a) so that the line of sight between the projector and receiver is 14' ± 4' above the elevation of the touchdown point. (b) at least 10 feet above the ground at all points along the light path.

   If it is impractical to install the transmissometer projector and receiver within the above limits at the preferred location, an alternate location shall be selected rather than violate the height limits.

6. ALIGNMENT OF TRANSMISSOMETER ELEMENTS. The line of sight between the projector and the receiver shall be unobstructed and level within 0.1° of horizontal.

7. TOLERANCES.

   a. Touchdown transmissometer - when a 500 foot baseline is used the distance between the front mounting screws of the projector and the receiver shall be 500' ± 6"; when a 250 foot baseline is used the same distance shall be 250' ± 6".

   b. Rollout transmissometer - the distance between the front mounting screws of the projector and the receiver is to be 250' ± 6".

   c. Tolerances for movement of the top of the receiver and stand are 0.01" displacement and 1 minute rotation.

   d. Tolerances for the top of the projector stand are 0.1" displacement and 5 minutes rotation.

8. INSTALLATION OF FOUNDATIONS AND SUPPORTS. The following information and associated drawings are provided only for planning guidance. Details will appear in an RVR construction and installation specification which will take precedence over material contained in this paragraph.

   a. Foundation. The main requisite for acceptable transmissometer operation is stability, beginning at the foundation and continuing throughout the entire system. Several types of concrete foundations have been designed to provide the required stability; the choice is determined by the soil and climatic conditions. Generally, a monolithic block is satisfactory, however, special soil conditions may require an inverted "T" or piers (pyramidal or conical). Occasionally installation of a foundation on piling may be necessary. See Figure 4 for one method of placement of concrete.

   b. Supports. Identical supports are provided for the projector and the receiver. All supports are basically the same as those shown in Figure 3.

c. Placement of Supports. Supports shall be assembled in accordance with the instructions provided by the manufacturer. A platform and railing shall be installed. Field drill the holes in the metal platform for bolting the platform to the support, for flanges, for the railing post, and for the upper ladder bracket. A safety chain shall be installed across the opening in the railing.

9. PLACEMENT OF EQUIPMENT.

a. Projector and Receiver. These elements are to be located at the locations and in accordance with the criteria specified in paragraph 4.

b. Signal Data Converter; Time Base Generator. These are to be located in the FAA equipment room in lieu of the Weather Bureau Office. In existing installations these components may be moved from the Weather Bureau Office to the FAA equipment room if a program has been established by the FAA. Where two RVR systems are installed, a separate Signal Data Converter Assembly will be required for each installation.

c. Analogue Recorder. The analogue recorder in most instances shall be located in the Weather Bureau Office and shall be available for use by FAA maintenance personnel where required for maintenance and calibration procedures. Location of the recorder in the Weather Bureau Office is determined on the premise that the Weather Bureau has a requirement for this readout as a permanent record, and that FAA maintenance and calibration procedures using this equipment are minimal. If it has been determined that the weather observation function shall be performed in a specific Flight Service Station or tower for inclusion in long line transmissions as an aid to flight planning, the analogue recorder shall be placed in the FSS, ATCT cab, or ATCT TRACON room to permit observations of ten minute RVR extremes in accordance with Manual of Surface Observations Circular N, Seventh edition, paragraph 2810 (4). This publication is issued by the Weather Bureau, Air Weather Service, and Naval Weather Service.

d. RVR-Receiver-Decoder. This unit is used only when the cable run from Signal Data Converter to the Remote Display unit is in the range of 300 feet to 25 miles. Its use may be required in installations where the Signal Data Converter remains in the Weather Bureau Office or where the Signal Data Converter is installed in the FAA equipment room and a Remote Display Unit is provided the Weather Bureau. The RVR receiver/decoder when utilized shall be installed in a position which is less than 300 feet from the Remote Display Unit.

e. RVR Computer Selector. This unit shall be installed in the FAA equipment room and in the Weather Bureau Office when required.

f. Remote Display Units. One or more up to a maximum of eight units shall be installed as programmed.

g. Telephone Communications. As noted in paragraph 10b of this criteria, telephone lines shall be installed, with jacks to permit communication between the locations of the projector, receiver, analogue recorder, and FAA equipment room. Spare cables serving the ILS should be utilized if practical to do so. Service by the local telephone company should be considered in the economic analysis of this circuit installation.

h. Day-Night Switch. A photoelectric switch is required with the RVR system. The switch is mounted facing north whenever possible. It shall be mounted near the controlling office, on the roof, in a window, on a pole, or at some other satisfactorily exposed site. (Note: Areas of bright lights shall be avoided since lights will tend to prevent the switch from changing to night conditions.) Three AWG#14 wires are required between the switch and the control panel.

i. General. Install all large flat metal surfaces such as junction boxes, so that minimum surface area faces the glide slope antenna to minimize re-radiation. A 110-VAC weather proof power outlet shall be provided at the junction box of the farthest unit, projector or receiver, from the glide slope antenna (Note: Recent procurements of this equipment have these installed in the junction box). This is primarily for the use of FAA electronic technicians to power a small receiver used for checking glide slope signals.

10. ELECTRICAL AND CABLE WORK.

a. System Power Requirements. A total of 3.0 KVA 60 HZ AC power is required for the system with all equipment on. 2.0 KVA is utilized in the field location; 1.0 KVA is used in the remaining portion of the installation. Values are approximate.

b. Cable Requirements. Two conductor AWG#8 600 volt direct burial cable shall be normally used for power cable; however, cable of sufficient size to supply a minimum of 105 VAC at the site with all equipment on, including heaters, may be used. A minimum of six conductors between the field site and the equipment room is required for signal and control. AWG#19 telephone type cable is adequate for this purpose. A minimum of two pairs of conductors is required between field units for signal and meter circuits. An additional pair for voice communications, plus a spare, shall be installed throughout the system with phone jack provisions at the projector, receiver, analogue recorder, and equipment room. Cable requirements shall be included with ILS glide slope installation requirements. At locations where cable installation costs are considered excessive, leasing of necessary quality and quantity of cables from the local telephone company shall be considered.

c. Unit Power Requirements. The approximate power requirements are as follows:

(1) Projector and obstruction light, 875 watts.

(2) Receiver and obstruction light, 1125 watts.

(3) Indicator and Recorder, 450 watts.

(4) RVR System:

(a) Signal data converter, 130 watts.

(b) Runway light intensity relay chassis, 10 watts.

(c) Receiver/decoder, 85 watts.

(d) Remote display, 15 watts.

(e) Computer selector, 50 watts.

d. Placement of Power Cable. Reference shall be made to the existing Agency power policy before planning the configuration of electrical power for the entire RVR system.

e. Obstruction Lights. Obstruction lights shall be placed on the projector and receiver supports unless they are shielded by a properly lighted and marked functional object (Ref. AC 120-20, 7b(1), 6/6/66). Installation shall conform to requirements of FAA Handbook No. 7460.1, Obstruction Marking and Lighting. A photoelectric or time switch shall be installed for lighting control.

CHAPTER 3. ACCEPTANCE TESTS AND COMMISSIONING PROCEDURES

11. ACCEPTANCE DOCUMENTATION.

Provisions of Order 6030.12, Form 198, Facility Equipment Performance and Adjustment Data shall apply to acceptance and commissioning of this equipment. Test data obtained at time of installation shall be entered on Preliminary Forms FAA Type 198 drawn up in the region in accordance with existing directions.

12. COORDINATION.

a. Representatives of the Weather Bureau will be invited to participate in joint acceptance procedures at joint use facilities. Suitable arrangements for participation shall be made at the time of coordinating siting criteria with them.

b. If deviations from the obstruction clearance criteria are required for the installation of the transmissometer, coordination of the deviation will be obtained through the Flight Standards Office.

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APPENDIX 1. SUPPLEMENTAL INFORMATION

The following Figures are included for information and guidance in site planning.

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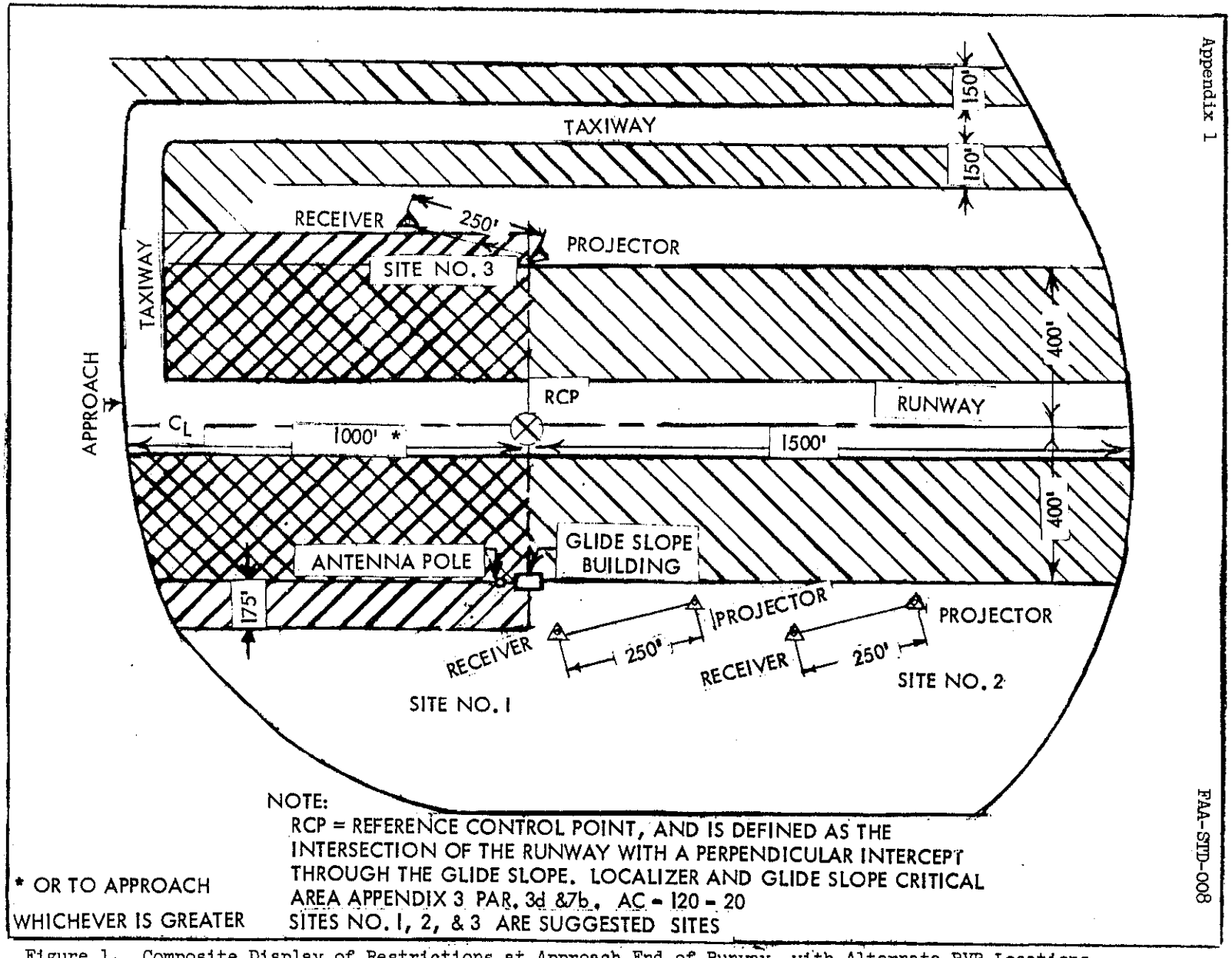
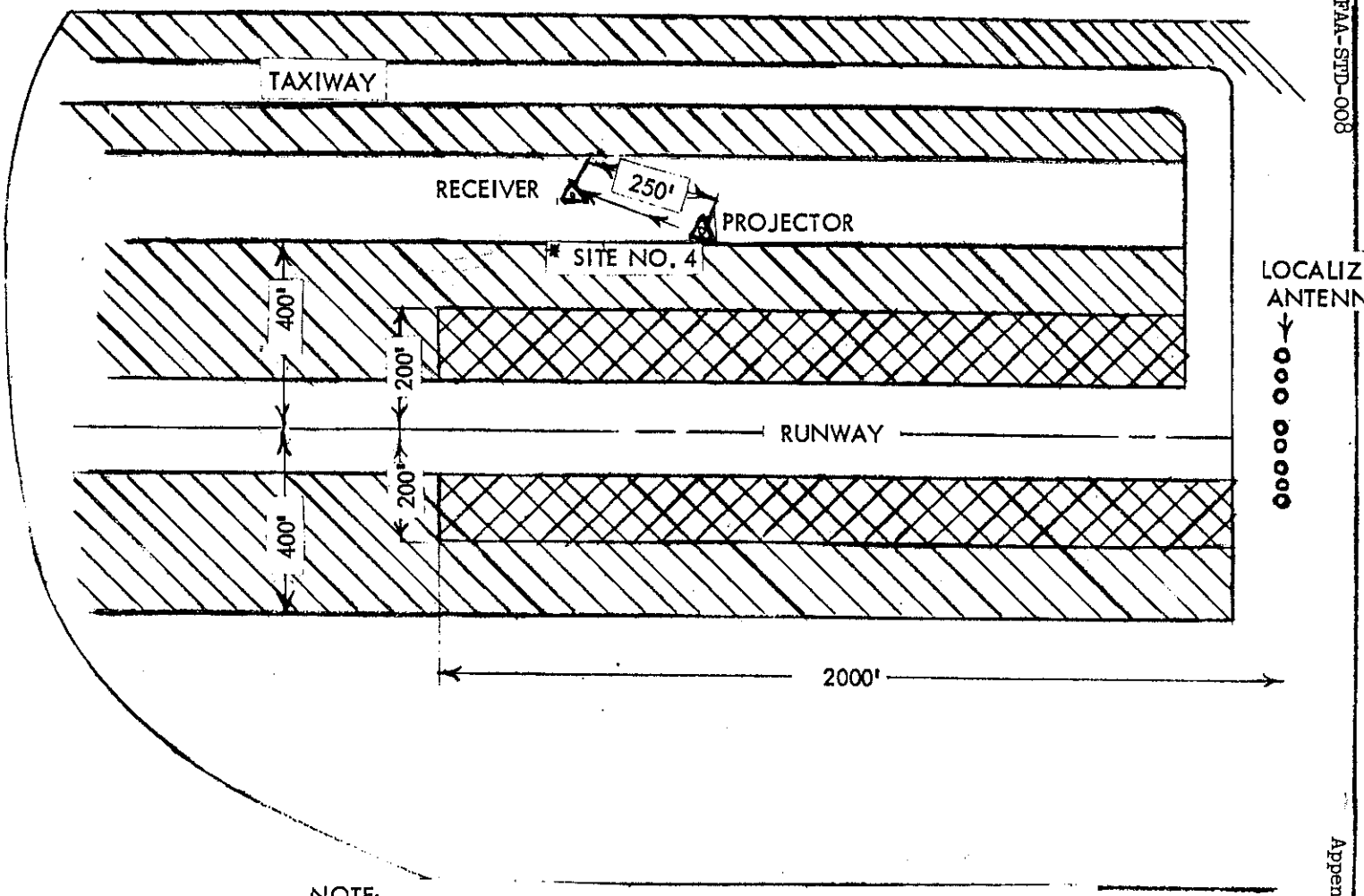


Figure 1. Composite Display of Restrictions at Approach End of Runway, with Alternate RVR Locations



NOTE:
DUAL ENDED ILS RUNWAY RESTRICTIONS SHOWN ON FIGURE #6 APPENDIX 3 ALSO LOCALIZER CRITICAL AREA APPENDIX 3 PAR. 3d.

*SITE NO. 4 IS A SUGGESTED SITE

Figure 2. Display of Restrictions at Rollout End of Runway

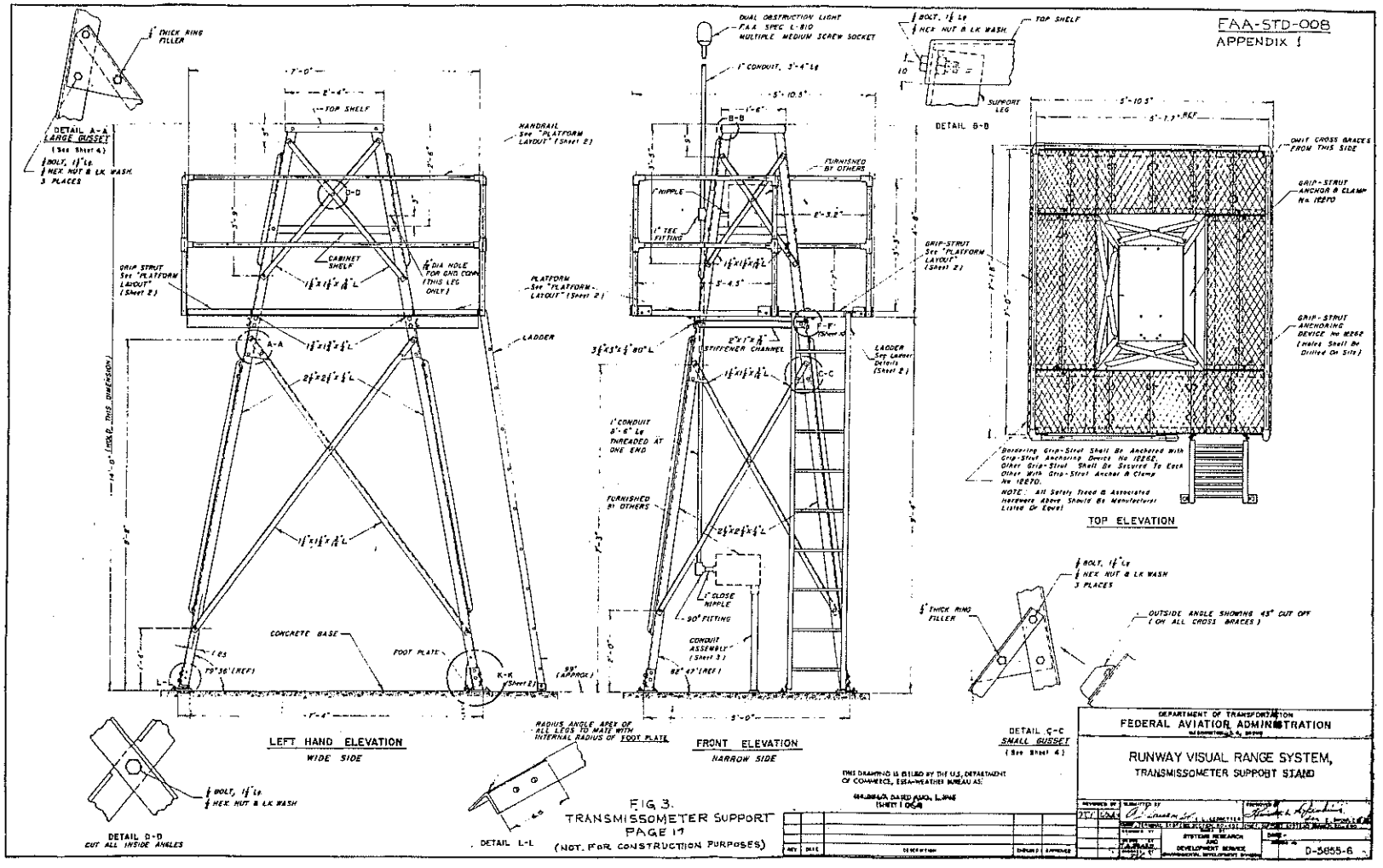


FIG. 3.
TRANSMISSOMETER SUPPORT
PAGE 17
(NOT FOR CONSTRUCTION PURPOSES)

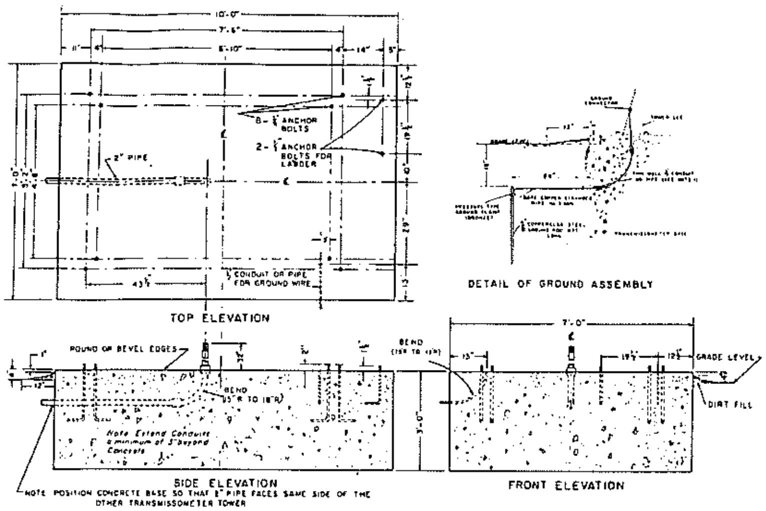
THIS DRAWING IS ISSUED BY THE U.S. DEPARTMENT OF COMMERCE, ESSA-WEATHER BUREAU AS:
[illegible] DATED JUNE, [illegible]
(SHEET 1 OF 4)

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

RUNWAY VISUAL RANGE SYSTEM,
TRANSMISSOMETER SUPPORT STAND

SYSTEMS RESEARCH AND DEVELOPMENT SERVICE

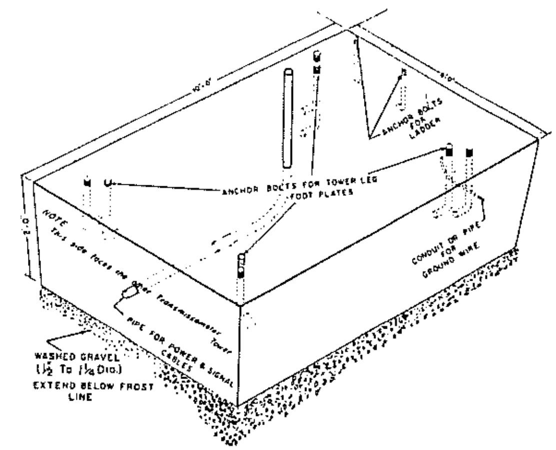
D-3655-6



PREFERRED

NOTES

1. Top of 1/2" conduit should not extend more than one inch above the concrete base. If thin wall conduit is used, it should be installed or cut off close to the top of the concrete to prevent unsightly rust stains on the concrete when the conduit corrodes. Coat the top of the conduit with a heavy coat of aluminum or zinc base paint after it has been installed.
2. Keep all sides and corners of the excavation square and even. Rounded corners tend to increase shifting of bases in unstable soils.
3. Use lumber at least 7-1/2 inches wide to form the sides of the concrete block exposed above the ground.
4. The dirt fill sloping away from the sides of the concrete block should be continuous around the block.
5. A one-piece 2" pipe bend may be substituted for the three-piece conduit assembly (bend, coupling, and straight pipe) embedded in the concrete.



ALTERNATE

NOTES

1. Frost action in some localities causes soil movement below a depth of three feet. At such locations, a concrete base set on coarse gravel should be substituted for the installation method shown.
2. Excavate the earth to a minimum depth of six inches below the frost level, making the hole 8 feet wide and 10 feet long. Build an 8 x 10-foot wooden form around the top of the excavation. Use lumber at least 7-1/2 inches wide so that the sides of the base will be neatly formed above grade and about 3-1/2 inches below grade. If preferred, the form may be constructed after the gravel bed has been added.
3. Fill the excavation with clean washed gravel to within 20 inches of the grade level. The gravel should be one-half inch to one and one-quarter inch in diameter and contain no sand or other fine soil materials which will fill the void spaces between the gravel stones. Thoroughly compact the gravel and level the top before pouring any concrete.
4. Position the 2-inch conduit assembly. Pour 24 inches of stiff concrete on top of the gravel bed. Position the bolts and conduits as dimensioned on method A. Smooth the top of the concrete. Bevel or round the edges for neat appearance or to prevent chipped edges.
5. Note that the length of the base is ten feet long in both drawings but the width differs by one foot. The dimensions between the bolts and conduits are the same in both drawings. All measurements taken from the ends or center lines will remain the same but measurements taken from either side of the base will be six inches more in method B than in method A.
6. The above method may also be used in areas where excessive moisture in clay or silt soils causes bases to shift.

FIG. 4
TRANSMISSOMETER BASE
PAGE 19
(NOT FOR CONSTRUCTION PURPOSES)

REV	DATE	DESCRIPTION	CHECKED	APPROVED

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D.C. 20590

RUNWAY VISUAL RANGE SYSTEM,
TRANSMISSOMETER SUPPORT CONCRETE BASE

SYSTEMS RESEARCH AND DEVELOPMENT SERVICE

D-5855-10

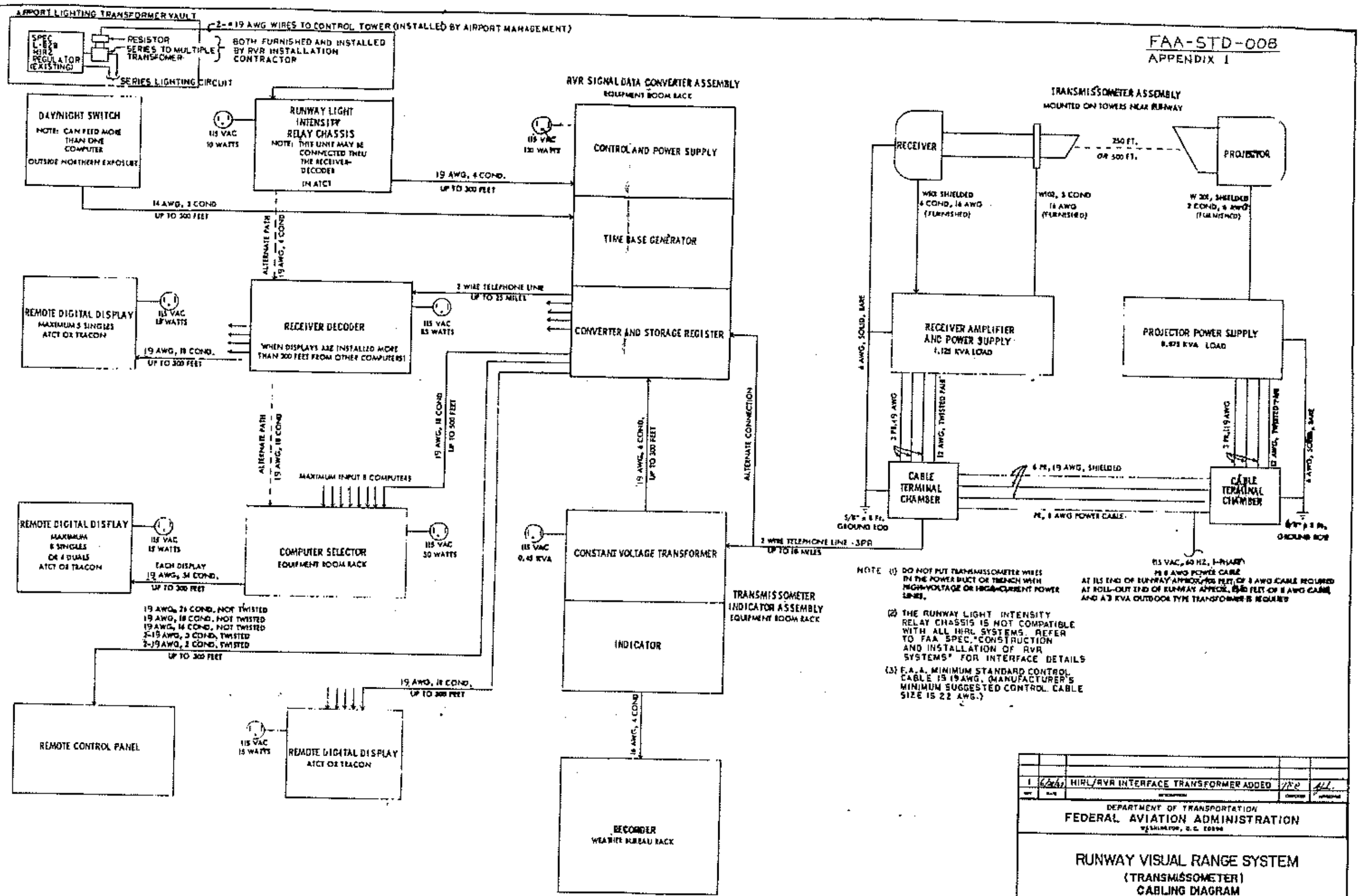


FIG. 5
RUNWAY VISUAL RANGE SYSTEM CABLING DIAGRAM

FIGURE 6. EQUIPMENT COMPONENT SIZES

Unit	Dimensions	Weight (#)
RVR Control and Power Supply Panel	8 3/4"hx19"wx17$\frac{1}{4}$"d	31
RVR Time Base Generator Panel	8 3/4"hx19"wx17$\frac{1}{4}$"d	33
RVR Converter and Storage Register Panel	8 3/4"hx19"wx17$\frac{1}{4}$"d	31
Remote Display	7"hx10"wx9"d	6#S, 10#D
Runway Light Intensity Relay Chassis	6"hx9"wx5"d	7
Receiver-Decoder Assembly	8 3/4"hx19"wx17$\frac{1}{4}$"d	35
RVR Computer Selector	10$\frac{1}{2}$"hx19"wx17$\frac{1}{4}$"d	58
RVR Remote Control Panel	8 3/4"hx19"wx6 1/8"d	11

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