ASME P30.1-2014

Planning for Load Handling Activities

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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The American Society of Mechanical Engineers

Two Park Avenue • New York, NY • 10016 USA

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FOREWORD

As load handling activities grow in complexity, there is an increased need to develop a set of recognized planning guidelines. While some guidance for planning of load handling activities, also referred to as lift planning, has been available in publications, literature from equipment manufacturers, and in-house procedures of various organizations and companies, there has not been any published comprehensive, broadly authoritative guidance available. The absence of uniform considerations or comprehensive practices has created an uneven range of planning activities.

In 2008, the B30 Standard Committee created a Task Group to consider the feasibility of developing a standard for lift planning. Based upon the report of the Task Group, the B30 Standard Committee favored the creation of a standard but recognized that such a standard would not fit the equipment-based orientation of B30. The American Society of Mechanical Engineers (ASME) and the American National Standards Institute (ANSI) were petitioned to form a committee to develop a lift planning standard.

The formation of the ASME P30 Standards Committee, Planning for the Use of Cranes, Derricks, Hoists, Cableways, Aerial Devices, and Lifting Accessories, was approved by ASME on June 8, 2010, and a Project Initiation Notification System (PINS) was posted in ANSI Standards Action on July 2, 2010. The Committee held its inaugural meeting on September 20, 2010, with the intent to develop a standard that provides guidance on general planning considerations and practices for load handling operations occurring in all industries, so that users could apply the Standard as a template and adapt it to the needs of their specific industry or situation.

This Edition of ASME P30.1 was approved by ANSI on January 14, 2014.

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Planning for the Use of Cranes, Derricks, Hoists, Cableways, Aerial Devices, and Lifting Accessories

(The following is the roster of the Committee at the time of approval of this Standard.)

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PLANNING FOR THE USE OF CRANES, DERRICKS, HOISTS, CABLEWAYS, AERIAL DEVICES, AND LIFTING ACCESSORIES

P30 STANDARD INTRODUCTION

SECTION I: CHARTER FOR P30 — PLANNING FOR THE USE OF CRANES, DERRICKS, HOISTS, CABLEWAYS, AERIAL DEVICES, AND LIFTING ACCESSORIES COMMITTEE

The development and maintenance of standards that support load handling activities where mechanical equipment including, but not limited to, cranes, derricks, hoists, cableways, aerial devices, material lifting accessories, and combinations thereof are used.

SECTION II: PURPOSE

The P30 Standard is intended to

(a) prevent or minimize injury to people, and otherwise provide for the protection of life, limb, and property by offering guidance for planning efforts that enhance the safety of load handling activities

(b) provide guidance to work site personnel, equipment owners, employers, users, and others concerned with or responsible for the safety of load handling activities

(c) guide governments and other regulatory bodies in the development, promulgation, and enforcement of appropriate safety directives

SECTION III: USE BY REGULATORY AGENCIES

This Standard may be adopted in whole or in part for governmental or regulatory use. If adopted for governmental use, the references to other codes and standards in this Standard may be changed to refer to the corresponding regulations of the regulatory agency or governmental authorities.

SECTION IV: EFFECTIVE DATE

(a) Effective Date. The effective date of this Standard shall be 1 yr after its date of issuance.

(b) The need to meet the guidelines established in the current edition of this Standard shall be evaluated by a qualified person, and any recommended changes to the user's planning activities shall be made within 1 yr.

SECTION V: REQUIREMENTS AND RECOMMENDATIONS

Requirements of this Standard are characterized by use of the word "shall."

Recommendations of this Standard are characterized by the word "should."

SECTION VI: REQUESTS FOR REVISION

The P30 Standards Committee will consider requests for revision. Such requests should be directed to

Secretary, P30 Standards Committee
ASME Codes and Standards
Two Park Avenue
New York, NY 10016-5990

SECTION VII: REQUESTS FOR INTERPRETATION

The P30 Standards Committee will render an interpretation of the provisions of the P30 Standard. Such requests should be directed to

Secretary, P30 Standards Committee
ASME Codes and Standards
Two Park Avenue
New York, NY 10016-5990

Interpretations to the P30 Standard will be published in the subsequent edition of the standard, and will be available online at http://cstools.asme.org/.

SECTION VIII: ADDITIONAL GUIDANCE

Load handling activities addressed by the P30 Standard are subject to hazards that cannot be abated solely through planning. Only by the application of knowledge, care, common sense, and experience can safe load handling activities be anticipated. It is therefore essential that personnel responsible for the planning and implementation of load handling activities are competent, qualified, and trained with the skills to satisfactorily accomplish their assigned tasks.

The P30 Standards Committee recognizes the importance of proper design factors, minimum or maximum dimensions, and other limiting criteria of equipment

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used in load handling activities. The P30 Committee expects that the equipment used to execute load handling activities meets the requirements of applicable equipment safety standards. The P30 Committee also expects that any recommendations or requirements provided in those standards are interpreted and applied correctly.

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PLANNING FOR LOAD HANDLING ACTIVITIES

Chapter 1
Scope and Definitions

1-1 SCOPE

This Standard establishes planning considerations and practices that apply to load handling equipment (LHE), other associated equipment, and activities when moving loads vertically or horizontally. The planning guidance contained in this Standard is divided into two categories dependent upon the nature of the load handling activity and the degree of exposure to the issues that impact safety. The categories are designated as standard lift plan and critical lift plan. This Standard does not preclude the user of this Standard from creating subcategories based on their specific load handling activity considerations.

The P30.1 Standard does not exclude any particular equipment or industry. This Standard may not address all of the hazards that could be encountered during a load handling activity. It is the responsibility of the user of this Standard to assess and address the hazards associated with a particular load handling activity.

An example lift plan template can be found in Nonmandatory Appendix A. A list of industry standards applicable to the equipment that may be used in load handling activities can be found in Nonmandatory Appendix B.

1-2 DEFINITIONS

D/d ratio: the ratio between the diameter of curvature, *D*, taken by the sling when in contact with an object and the diameter of the wire rope, synthetic rope, or chain, *d*.

dynamic load: forces introduced into the LHE as a result of change in motion.

lift: to move a load vertically or horizontally with the LHE.

lift director (load handling director): the person designated to direct the load handling activity.

lift plan: information and/or instruction, written or verbal, used in support of a load handling activity.

load handling equipment (LHE): equipment used to move a load vertically or horizontally.

qualified person: a person who, by possession of a recognized degree or certificate of professional standing in an applicable field, or by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.

shall: term used to indicate that a rule is mandatory and must be followed.

should: term used to indicate that a rule is a recommendation, the advisability of which depends on the facts in each situation.

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Chapter 2
Load Handling Activity Considerations and Plan Categories

2-1 LOAD HANDLING ACTIVITY CONSIDERATIONS

An evaluation of a proposed load handling activity shall be performed (see Fig. 2-1-1). Documentation of the evaluation is not required. At a minimum, the load handling category should be determined based on review of the following considerations:

(a) Potential Hazards to Persons

(1) if the load handling activity will involve personnel lifting.

(2) if the load will be moved or suspended over areas accessible to the general public.

(3) if the load contains materials immediately dangerous to life and health.

(4) if load handling personnel will be in locations that may be hazardous during the load handling activity (e.g., pinch points, crush points).

(5) if site personnel other than load handling personnel will be in locations that are hazardous due to the load handling activity. This should include consideration of protection provided by existing structures.

(b) Hazards in Proximity to the Work Area

(1) if the load and/or the LHE can encroach the prohibited zone of power lines

(2) if there is potential for electromagnetic radiation/radio frequency hazard (e.g., loss of communication, electrical discharge, shock)

(3) if the load handling activity can cause damage to pipes, lines, tanks, equipment, or products that could create an adverse environmental impact

(c) Complexity of Load Handling Activity

(1) if the load has potential for instability during the load handling activity due to the

(a) design or configuration of the load (e.g., shape, load integrity, sail area)

(b) center-of-gravity of the load relative to the established connection points

(c) load weight shift (e.g., liquid filled, swing arms, moveable parts)

(2) if the load handling activity uses complex load handling methods

(3) if the load handling activity will be performed in proximity to obstructions or in limited clearance areas, including consideration of clearance between the LHE and the load

(4) if the load is to be manipulated (e.g., turned, rotated, tilted)

(5) if the LHE travels during the lift

(6) if the load handling activity uses multiple LHE

(7) if the load handling activity is unique to or infrequently performed by the personnel involved

(8) if special means or access for attaching and removing rigging is required

(d) Adverse Impact From Environmental Conditions. If the load handling activity could be adversely impacted by conditions such as

(1) effects of wind on the load and/or LHE (e.g., speed, direction, sustained, and/or gusts)

(2) support for the load, the LHE, or both (e.g., ground, rail, girder, structure, foundation, vessel list, and trim)

(3) ambient temperature (e.g., high, low, range)

(4) surfaces moving relative to one another (e.g., from land to water or water to water)

(5) visibility (e.g., fog, sun glare, lighting, obstructions)

(6) precipitation

(7) lightning

(e) LHE and Rigging Capacity and/or Performance

(1) if the load weight is significant compared to the LHE or rigging capacity as configured

(2) if any of the following factors has the potential to encroach upon maximum capacity of the LHE or the rigging, as configured, and/or affect its performance:

(a) increased loading due to extraction or removal of a load (e.g., demolition, suction, friction)

(b) dynamic loading (e.g., abrupt starting, stopping, acceleration, deceleration, abrupt load transfer)

(c) line pull

(d) brake/clutch/pump settings and/or conditions

(e) accuracy of load weight information/determination

(f) site conditions as outlined in para. 5-2.6

(g) load shift during load handling activity

(h) weight distribution or transfer between multiple LHEs

(i) effects of moving to/from liquids (current, buoyancy)

(j) out-of-plane loading

(3) equipment history or condition

(f) Adverse Commercial Impact

(1) if the load has a significant replacement time

(2) if the cost of replacing the load is considered significant or the load is irreplaceable

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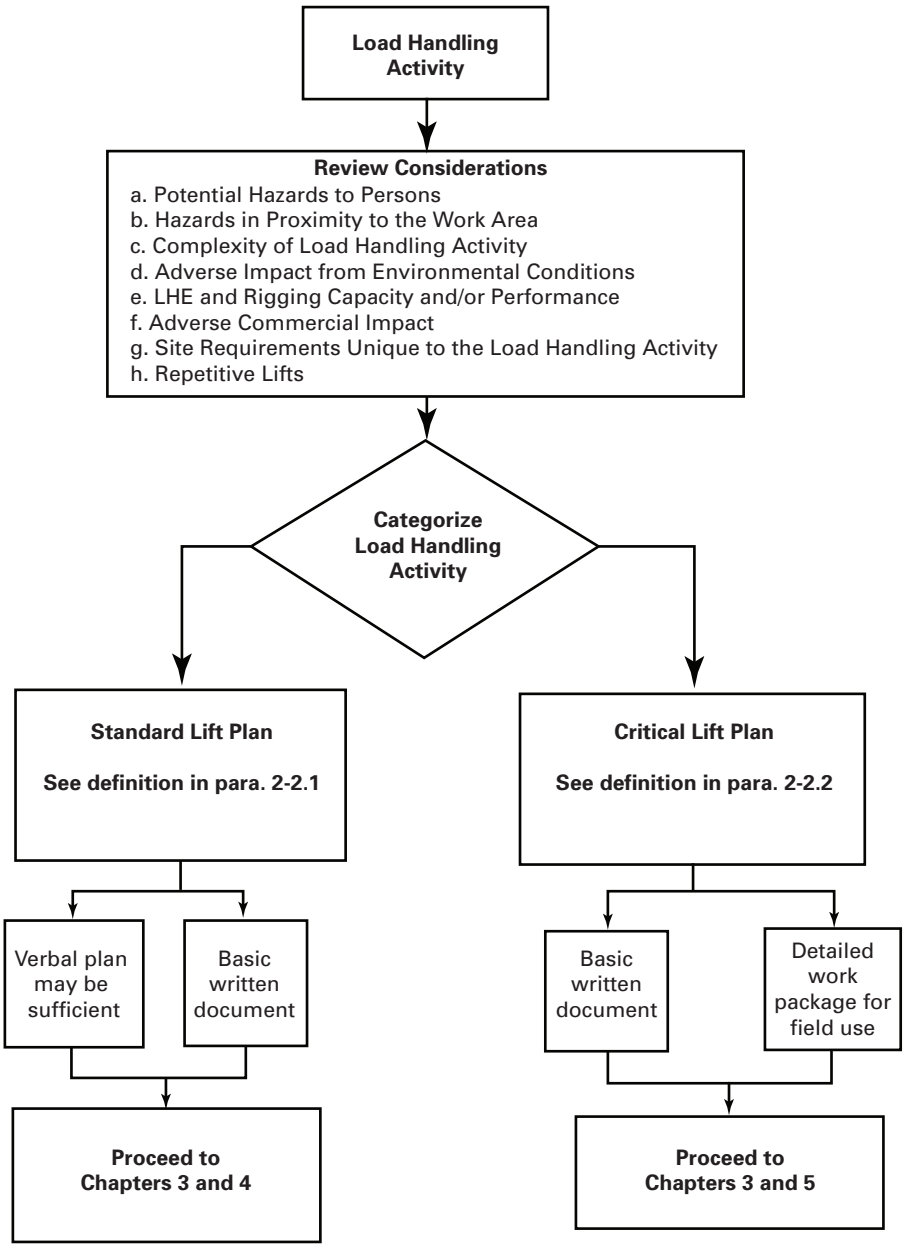
Fig. 2-1-1 Load Handling Activity Categorization



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(3) if failure to complete the load handling activity could create a project delay, work shutdown, or disruption to the general public

(4) if the load handling activity can cause damage to pipes, lines, tanks, equipment, or products that could create an adverse commercial impact

(g) Site Requirements Unique to the Load Handling Activity

(1) corporate considerations/policies

(2) regulatory considerations [e.g., local, state, federal, DOT, railroad (FRA), FAA, military]

(3) potential impact to vital infrastructure (e.g., public utilities, roadways, seaports, pipelines, railroads)

(h) Repetitive Lifts

(1) distractions, fatigue, inattention, or lack of concentration of the load handling personnel

(2) the LHE and rigging equipment manufacturer's recommendations for duty cycle or repetitive operations

2-2 PLAN CATEGORIES

2-2.1 Standard Lift Plan

A standard lift plan is a proposed load handling activity plan in which considerations in para. 2-1 have been evaluated and it has been determined that the load handling activity can be accomplished through standard procedures, and that the load handling activity personnel can execute using common methods, materials, and equipment.

2-2.2 Critical Lift Plan

A critical lift plan is a proposed load handling activity plan in which considerations in para. 2-1 have been evaluated and it has been determined that the load handling activity exceeds standard lift plan criteria and requires additional planning, procedures, or methods to mitigate the greater risk.

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Chapter 3
Personnel and Responsibilities

3-1 PERSONNEL QUALIFICATION/COMPETENCE

Persons performing the lift planning and load handling activities shall be qualified and competent, as determined by the employer or employer's representative, to perform the assigned tasks.

All personnel involved in the load handling activities shall meet the qualifying criteria established in applicable consensus standard(s), site-specific requirements, or regulations.

3-2 ROLES AND RESPONSIBILITIES

It is essential that roles and responsibilities identified in the lift plan are defined and understood by all personnel involved. The roles and responsibilities may include, but are not limited to, those outlined below. Not all of the roles below may be identified in or required by the lift plan. In some cases an individual or entity may perform multiple, nonconflicting roles.

(a) Assembly/Disassembly Director — responsible for directing the assembly/disassembly (erect/dismantle) of the LHE.

(b) Engineer — responsible for providing any required engineering support and documentation for the load handling activity.

(c) General Contractor/Construction Manager — responsible for contractual requirements including deliverables, and ensuring performance and safety requirements are established and implemented.

(d) Lift Director — responsible for verifying the category of the load handling activity and reviewing and implementing the lift plan.

(e) LHE Operator — responsible for directly controlling the LHE's functions.

(f) LHE Owner — responsible for custodial control of the LHE by virtue of a lease or ownership.

(g) LHE User — responsible for arranging the LHE's presence on a work site and controlling its use.

(h) Lift Planner — responsible for developing the lift plan.

(i) Rigger — responsible for performing rigging tasks associated with the load handling activity.

(j) Signalperson — responsible for directing the movements of the LHE by providing signal commands to the LHE operator.

(k) Site Safety Officer — responsible for enforcing work site safety policies.

(l) Site Supervisor — responsible for overseeing the work site on which the LHE is used and the work that is performed on the site.

(m) Spotter — responsible for observing and reporting as directed on the movement of the LHE and load.

(n) Transport Operator — responsible for operation of transport equipment used in support of the load handling activity.

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Chapter 4
Standard Lift Plan

4-1 INTRODUCTION

The decision to use a standard lift plan should be based on the considerations outlined in Chapter 2. The lift director should determine that none of these considerations would cause the load handling activity to be recategorized.

Prior to the load handling activity, the lift director should verify that the standard lift plan has been developed. The standard lift plan can be written or verbal. See Nonmandatory Appendix A for an example lift plan template.

4-2 STANDARD LIFT PLAN DEVELOPMENT

(a) The standard lift plan should identify, evaluate, and address the following for all phases of the load handling activity:

(1) the load, its weight, center of gravity, and attachment points

(2) the gross load is within the LHE's rated capacity as configured

(3) the rigging

(a) is selected to have sufficient rated capacity for the intended configuration

(b) is configured to secure and stabilize the load

(c) and the load are protected from damage

(4) movement of the LHE and load

(5) the personnel required to execute the load handling activity

(6) site conditions, weather, work area, LHE foundation and support, utilities, support services, and ancillary equipment

(7) communication method or system

(8) site control for vehicular and pedestrian access and potential interferences

(9) contingency considerations

(10) emergency action plan

(11) for repetitive lifts, additional LHE and rigging inspection and maintenance

(b) Standard lift plans do not require documentation unless required by site policies or as otherwise warranted.

4-3 PRE-LIFT REVIEW

(a) Prior to executing the load handling activity, the participants should communicate and agree upon the details of the plan and their assignments.

(b) For repetitive lifts, the lift director should decide the frequency of pre-lift reviews. Pre-lift reviews may not be required prior to each repetition of the lift.

(c) Concerns raised during the pre-lift review should be addressed prior to proceeding with the load handling activity.

4-4 EXECUTING THE STANDARD LIFT PLAN

(a) The load handling activity should only commence after

(1) all setup and preparation requirements of the plan are in place

(2) all required inspections and tests of the LHE and rigging equipment have been completed

(3) all requirements of the plan continue to be met and no conditions exist that would preclude implementation of the plan

(b) If the operation deviates from the plan, the load handling activity should be stopped and evaluated. The deviation should be resolved before resuming the load handling activity. Changes or modifications to the plan should be communicated to all affected load handling personnel.

4-5 POST-LIFT REVIEW

(a) After completion of the load handling activity, any measures identified by the participants to improve future load handling activities should be communicated to the appropriate personnel.

(b) For repetitive lifts, the lift director should decide the frequency of post-lift reviews and evaluation of the lift plan. Post-lift reviews may not be required after each repetition of the load handling activity.

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Chapter 5
Critical Lift Plan

5-1 INTRODUCTION

The decision to use a critical lift plan should be based on the considerations outlined in Chapter 2.

The critical lift plan shall be written prior to executing the load handling activity. See Nonmandatory Appendix A for an example lift plan template.

5-2 CRITICAL LIFT PLAN DEVELOPMENT

The critical lift plan should address the applicable items identified in paras. 5-2.1 through 5-2.10 and any additional considerations identified during the planning process.

5-2.1 The Load

(a) Identify the load's weight, center of gravity, and dimensions, and the sources of that information.

(b) Identify components that could shift during the load handling activity and develop a method for securing, if required.

(c) Identify the load attachment or contact points and ensure that they are suitable for the load to be handled, while maintaining load integrity.

(d) Identify the requirements to be met for the load's orientation and securement prior to the release of the LHE and rigging.

5-2.2 Load Handling Equipment

(a) Identify the LHE and the anticipated configuration(s).

(b) Ensure that the LHE is capable of handling the total anticipated load, including the rigging, accessories, and attachments in the intended configuration(s), giving consideration to the factors listed in (e).

(c) Ensure that the LHE is in compliance with the requirements of the site, the manufacturer or qualified person, industry-recognized standards (e.g., applicable ASME B30 Volume), and federal, state, or local regulations.

(d) Establish the process to set up, erect, or install, and dismantle the LHE using the information provided by

(1) the manufacturer

(2) a qualified person

(3) site-specific recommendations

(4) applicable regulatory requirements

(e) Identify all required inspections and tests on the LHE that need to be performed using the information provided by the manufacturer, a qualified person, site-specific recommendations, or applicable regulatory requirements. For repetitive lifts, additional LHE inspection and maintenance should be considered.

5-2.3 Rigging

(a) Establish the rigging method that will support and secure the load and is suitable for the load handling activity.

(b) Ensure that the rigging method and the equipment have the capacity to support the load, in the configuration or geometry required, giving consideration to the factors addressed in para. 5-2.1 and the following:

(1) dynamic effects (beyond that considered in the design of the equipment)

(2) adverse environmental conditions (temperature, wind, water/ice)

(3) position of the center of gravity relative to rigging support points

(4) *D/d* ratio

(c) Identify the weight of the rigging, accessories, and attachments, and the sources of that information.

(d) Establish the process to ensure that the rigging equipment meets the manufacturer's specifications, regulations, industry-recognized standards (e.g., ASME B30.9, B30.20, B30.26), and site-specific requirements for the methods and equipment selected.

(e) Identify all necessary inspections and tests for the rigging equipment.

(f) For repetitive lifts, establish any additional rigging inspection and maintenance requirements that may be necessary.

(g) Establish the process to install and disassemble the rigging equipment using the information provided by

(1) the manufacturer

(2) a qualified person

(3) site-specific recommendations

(4) applicable regulatory requirements

(h) Ensure that the rigging will be protected from damage during the load handling activity from conditions such as the following:

(1) temperature (e.g., shielding from heat, cold)

(2) degradation (e.g., chemically active environment)

(3) cutting, abrasion, and friction damage (e.g., turning, shifting, contact with edges)

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5-2.4 LHE and Load Travel Path

(a) Identify travel path(s) of the load and LHE.

(b) Ensure that the load and LHE have adequate clearance to prevent contact with site-specific hazards or obstructions during the load handling activity (e.g., LHE to LHE, load to LHE, tail swing, boom/attachment clearance, headroom).

(c) Consider the factors addressed in paras. 5-2.6 and 5-2.8 and the following:

(1) dynamic movement

(2) environmental (e.g., temperature, wind, water/ice)

(3) load eccentricities during operation

(d) Identify the need for load control [e.g., tag line(s), push/pull poles].

(e) Identify positioning and movement of personnel required to support the load handling activity.

(f) Identify effects of slope or grade on the LHE.

5-2.5 Personnel

(a) Identify tasks to be completed prior to, during, and after the load handling activity, and the personnel required to complete each task. (See Chapter 3.)

(b) Identify specialized training of personnel necessary to accomplish the load handling activity, if required.

5-2.6 Site, Services, and Ancillary Equipment

(a) The following site parameters/conditions/services required to perform the load handling activity should be identified:

(1) the work area(s) required (e.g., equipment setup, laydown, load, and LHE path).

(2) support services/utilities (e.g., air, electrical, water).

(3) ancillary equipment required (e.g., high reach equipment, assist LHE).

(4) unobstructed access, travel path, and egress for the LHE and the load.

(5) suitable LHE foundation and support requirements during all phases of the load handling activity. Considerations should include, but not be limited to

(a) soils analysis (e.g., allowable ground pressure)

(b) potential for change to support due to environmental conditions (e.g., erosion, frost heave, water saturation, flooding)

(c) supporting structure integrity (e.g., piers, slabs, bridge decks, foundations, pavements, buildings, crane mats, cribbing)

(d) site-specific hazards such as vaults, pipelines, tunnels, previous excavations, or voids

(e) presence of additional loads imposed by surrounding structures on the LHE foundation

(f) presence of additional loads imposed by LHE on surrounding structures, excavations, or backfill

(6) requirements that ensure sufficient capacity, stability, and orientation to support the load at the point of origin and landing point.

(b) Ensure that all adjustments, soil mitigation, and reinforcements are completed prior to performing the load handling activity.

5-2.7 Communication System

(a) Identify suitable communication systems for use during the load handling activity, such as the following:

(1) hand signals

(2) voice signals (e.g., direct, radio, hardwire audio)

(3) video

(4) horns or other audible signals

(5) signal or warning lights

(b) Identify a backup communication system and plan in case the primary communication system becomes ineffective.

5-2.8 Site Control

(a) Identify the vehicular and pedestrian access and the traffic controls to be used.

(b) Ensure that the plan addresses the following:

(1) vehicular and pedestrian traffic in and around the site that could be affected by or will affect the load handling activity

(2) potential interference from other site activities and the controls to be in place

(c) Identify location of barricades or other measures to be put in place to restrict traffic or prohibit interference during the load handling activity.

5-2.9 Contingency Considerations

The plan should address, at a minimum, the following potential events that could cause a deviation from the lift plan:

(a) equipment malfunction (e.g., LHE power failure, fouled rigging, radio communication failure)

(b) adverse changes to environmental conditions (e.g., weather, visibility)

(c) deviation from the planned load characteristics as identified in para. 5-2.1

(d) adverse changes to site conditions (e.g., surrounding activities, change in ground conditions, unauthorized entry into the work site as identified in para. 5-2.8)

5-2.10 Emergency Action Plan

(a) Review any existing site-specific emergency action plans and coordinate any required modifications.

(b) Identify the need for an emergency action plan directly related to the load handling activity.

5-3 PRE-LIFT MEETING

The lift director should hold a pre-lift meeting to discuss the plan and the roles of the personnel involved.

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(a) At a minimum, the following elements should be reviewed with all load handling activity personnel:

(1) overview of the load handling activity

(2) LHE, rigging, and other equipment involved in the load handling activity

(3) the sequence of events and step-by-step procedures for the entire load handling activity

(4) safety measures, as required (e.g., Job Safety Analysis action items)

(5) load handling activity personnel assignments, addressing

(a) individual responsibilities (e.g., location, time, task)

(b) work location hazards (e.g., pinch points)

(c) communication methods

(d) personal protective equipment requirements

(e) qualification(s) of assigned personnel

(6) any contingency measures as determined in para. 5-2.9

(7) any emergency action plan as determined in para. 5-2.10

(b) Concerns raised during this meeting shall be addressed prior to proceeding with the load handling activity.

(c) At the completion of the pre-lift meeting, the lift director should confirm that the attendees understand the plan and their roles and responsibilities during the load handling activity.

(d) For repetitive lifts, the lift director should decide the frequency of pre-lift meetings. Pre-lift meetings may not be required prior to each repetition of the load handling activity.

5-4 EXECUTING THE CRITICAL LIFT PLAN

5-4.1 Preparation for the Load Handling Activity

The lift director should confirm that all setup and preparation requirements of the plan (see sections 5-2 through 5-3) are in place and all required inspections and tests on the LHE(s) and rigging equipment have been completed.

5-4.2 Initiating the Load Handling Activity

Immediately prior to performing the load handling activity, the lift director should ensure that either

(a) all requirements of the plan continue to be met and no conditions exist that would preclude implementation of the plan; or

(b) a deviation exists, in which case the load handling activity is not initiated until the deviation is addressed by a qualified person or the lift director determines that conditions are acceptable to allow the activity to begin.

5-4.3 During the Load Handling Activity

The lift director should ensure that the load handling activity continues to comply with the plan.

(a) If the operation deviates from the plan, the load handling activity should be stopped and evaluated to determine if

(1) the load handling activity can resume according to plan;

(2) the contingency measures can be implemented per para. 5-2.9;

(3) the plan can be readily modified at the site to accommodate an unexpected condition or event; or

(4) the load handling activity can no longer be implemented as planned, requiring a modified plan to be prepared. In such cases, the load and the LHE shall be secured, if possible, until a new plan can be developed.

(b) Changes or modifications to the plan should be communicated to all affected load handling personnel prior to initiating the change.

(c) If the load handling activity is stopped for any reason, only the lift director may initiate a restart.

5-5 POST-LIFT REVIEW

After the completion of the load handling activity, the lift director should

(a) review the development, planning, and execution of the load handling activity with the load handling personnel. Items for review should include, but not be limited to, the requirements of sections 5-2 through 5-4.

(b) identify potential measures to improve future load handling activity.

(c) communicate any recommendations identified in (b) to the appropriate personnel for future consideration.

(d) for repetitive lifts, decide the frequency of post-lift reviews and evaluation of the lift plan. Post-lift reviews may not be required after each repetition of the load handling activity.

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NONMANDATORY APPENDIX A
EXAMPLE LIFT PLAN

A-1 INTRODUCTION

A documented lift plan may be one or more pages comprised of applicable data files, charts, schematics, and procedural instructions. Figure A-1-1 is offered as an example of a blank planning document for a single mobile crane load handling activity and may be modified by the user as required. Section A-2 contains lift data sheet instructions and an example of a completed lift data sheet.

Similar documents can be developed for LHE performing a variety of vertical and horizontal load handling.

A-2 LIFT DATA SHEET INSTRUCTIONS AND COMMENTARY

A-2.1 General

A lift data sheet (LDS) summarizes the essential details of a lifting operation in a standardized, easy to read form. It should include

(a) a brief description of the operation to be undertaken

(b) load characteristics including weight and center of gravity

(c) details of the crane or other LHE to be used including specific configuration

(d) a summation of the total load to the LHE

(e) LHE rated capacities during the relevant phases of the operation

(f) a comparison of total load to the LHE versus LHE capacity throughout the operation (as a percentage)

(g) a comparison of total load supported by the LHE's reeved load line versus the rated capacity of the reeved load line (as a percentage)

(h) notes outlining key operational requirements on which the validity of the data sheet is based

(i) a list of relevant attachments included (e.g., LHE chart extract, layout, and rigging sketches)

(j) any required review and approval signatures and applicable statutory requirements such as a Professional Engineer's stamp.

The LDS should be designed to suit the type of operation to be undertaken (e.g., mobile crane — single lift, mobile crane — tandem/multiple crane lift, tower crane lift, overhead traveling crane lift, jacking and rolling activity, lift system, or gantry lift). It is unlikely that a single format sheet will suffice for every eventuality.

A-2.2 Example Data Sheet

For guidance, an example of a blank lift data sheet for a lifting operation using a single mobile crane is included (see Fig. A-1-1). To assist in understanding how to fill out this LDS, a version completed with sample data is also included (see Fig. A-2-1).

Crane chart capacities for mobile cranes are the load the crane is rated to support at the boom or jib head as applicable. To evaluate what percentage of that capacity it is planned to use, it is first necessary to summate the total load applied to the crane at the boom or jib head.

Note that in the case of LHE such as tower cranes or overhead traveling cranes, the situation is slightly different, as the capacity is likely to be quoted at the hook block. Other forms of LHE may also differ — read the manufacturer's manual and adjust your data sheet accordingly.

A-2.3 Completing the Example LDS

A-2.3.1 Payload and Crane Details Sections. The first two sections, "Payload" and "Crane Details," are self-explanatory. Mark nonapplicable fields as "N/A" rather than leaving them blank (which could be construed as an omission).

The "single hoist line pull" is the rated winch line pull. "Parts line used" are the actual parts of line with which the crane is reeved for the lift (not necessarily the maximum for which it is equipped). "Reeved capacity" is the hoisting capacity as reeved, typically the parts of line times the rated single line pull. This figure is carried below.

A-2.3.2 Load Details. The next three subsections relate to load applied to the crane.

(a) Load Details — the weight of the payload, any attachments to it (such as ladders and platforms, insulation), or contents (such as oil, catalyst) can be summated here to yield a total payload weight.

(b) Rigging Data — the weight of rigging materials to attach the load to the crane hook is weight on the crane and has to be considered. This section allows the rigging items to be described, quantified, and summed to give a total weight of rigging.

(c) Additional Weight Items — allowance has to be made for

(1) the weight of the main hook (block) being used to suspend the payload.

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(2) the weight of the parts of hoist line below the boom or jib head (whichever is being used), i.e., the number of parts of line being used times the longest anticipated drop from boom or jib tip to the hook block (ft) times the weight per foot of the hoist line. Check the manufacturer's manual to determine if the weight of the wire rope necessary to lift the suspended load has been accounted for in the load chart and the weight of any extra reeved parts of line need to be added as additional weight, or if all parts of line need to be accounted for as additional weight.

(3) jibs where fitted when using the main boom; the weight allowances to be considered vary according to whether the jib is erected, stowed, extended, or retracted — consult the manufacturer's manual.

(4) the weight of other suspended hooks/overhaul balls fitted and the weight of the associated suspended hoist lines.

(5) boom extensions/runners/auxiliary boom sheaves and other similar attachments fitted to the boom or jib (when the chart being used does not relate to their use).

Totaling the above three subtotals (payload plus rigging plus additional weight items) gives the total weight to the crane for comparison with the rated capacity.

A-2.3.3 Crane Capacities. The next section relates to the crane capacities. Capacity varies according not only to configuration but also to operating radius. Three columns are provided on this particular sheet allowing the user to calculate the loads at up to three different radii as applicable (e.g., hoist, swing, and place). It may however be sufficient to consider only the worst radius. For each column to be used, enter first the actual radius of operation then, unless capacity interpolation for that specific radius is allowed, the next greatest radius for which a chart capacity is quoted. The next line, "Chart Capacity," is for entering the rated capacity of the crane at the aforementioned chart radius. Ensure use of the correct chart specific to that particular crane in the particular configuration in which it is being used.

The "Total Load to Crane" divided by "Crane Capacity" yields the percentage of chart capacity being used for each radius for which the calculation is performed. Knowing this figure at up to three operating radii, the "Maximum Percentage of Chart Capacity Used" can be noted.

The total suspended load is the load supported by the main hoist lines equal to the total of "Total Weight of Item to be Lifted" plus "Total Rigging Weight" plus the weight of the hook block being used plus the self weight of the reeved hoist lines being used.

NOTE: The weight of any stowed jibs or other boom attachments or of any other suspended hooks is not being supported by the main hoist line reeving and therefore does not need to be considered.

The "Maximum Percentage of Reeved Capacity Planned to Be Used" is "Total Suspended Load (main)" divided by the reeved capacity (from above) — see the "Crane Details" section.

A-2.3.4 Document Attachments. This section lists documents commonly attached to an LDS (e.g., a crane layout, rigging arrangement, and crane chart extract). Not all will be relevant or required. The user should mark (check) those he/she has appended, adding to the list as required. Note the acronyms: GBP (ground bearing pressure); JHA (job hazard analysis)/JSA (job safety analysis)/AHA (activity hazard analysis).

A-2.3.5 Notes. In this section, the user should include any further information (e.g., warnings, references, instructions) essential to the safety of the operation. This section may also detail the crane operating mode if not adequately described elsewhere.

Included in this section are

(a) a line allowing the user to compare the planned imposed ground loading (typically derived from a ground bearing pressure estimator further distributed through any load-spreading mats or blocking/cribbing provided) with the permissible ground bearing pressure (as derived from geotechnical data, calculation, or other informed guidance)

(b) a line in which the maximum wind speed for the operation should be entered

A-2.3.6 Signatures and Approvals. This section is to be completed by the preparer, checked, and approved by qualified and competent persons as required by governing policies (modify the sheet as required).

Where this document forms the official record of the operation, applicable legislation or contractual stipulations may require it to be stamped by a knowledgeable PE, in which case it shall appear prominently in a relatively clear area of the sheet.

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Fig. A-1-1 Lift Data Sheet

LIFT DATA SHEET (Single mobile crane lift)

Payload Name: **Lift Description:**

Project: **Units:** U.S. (ft-lb)

Crane Details **Manufacturer:** **Model No.**

Configuration:			Base Mount Type:			Track/outrigger c/s:	ft
Boom Type:			Boom Length Used:		ft	Boom/jib angle:	deg
Jib Type:			Jib Length Used:		ft	Tail swing:	ft
Machine ballast:		lb	Aux counterweight:		lb		
Block Cap'y:		ton	Line Size:		in.		
Single hoist line pull:		lb	Parts Line Used:			Reeved capacity:	lb
Heavy Lift Attachmts:			SL radius		ft	Superlift wt	ton

Load Details	**Quantity**	**Wt./each**	**Weight**	**Totals**
Basic weight of item			lb	
			lb	
			lb	
			lb	
			lb	
		Total weight of item to be lifted		**lb**
Rigging Data (size, type, and capacity)				
			lb	
			lb	
			lb	
			lb	
			lb	
			lb	
			lb	
		Total Rigging Weight		**lb**
Additional Weight Items				
Main Hook			lb	
Wire Rope			lb	
Other Suspended Hooks			lb	
Aux Boom Sheaves			lb	
Jib			lb	
Other			lb	
Other			lb	
		Total Additional Weight:		**lb**
		GROSS LOAD (sum of all items above)		**lb**

Crane capacities			
Total load to crane:	lb	lb	lb
Planned Radius:	ft	ft	ft
Chart Radius Used:	ft	ft	ft
Chart Capacity:	lb	lb	lb
% of chart capacity:			

THE MAXIMUM PERCENTAGE OF CHART CAPACITY PLANNED TO BE USED IS %

Total suspended load (main): lb **Reeved capacity:** lb

THE MAXIMUM PERCENTAGE OF REEVED CAPACITY PLANNED TO BE USED IS %

Document Attachments

☐	Crane layout	☐	Plan Categorization	☐	GBP source/calcs
☐	Rigging hookup arrangement	☐	JHA/JSA/AHA	☐	Project Scope
☐	Crane chart extract	☐	Risk Evaluation	☐	Load Weight/CG Source info
☐	Foundation details/calcs	☐	Wind/Weather Forecast	☐	Load/Crane Clearances
☐	Crane cribbing arrangement	☐	Drawing of load	☐	

Notes **Ground Bearing Pressure:** Allowable: **Actual:**

Max. allowable wind speed: Allowable:

	Name (Print)	**Signature**	**Title**	**Date**
Prepared by:				
Checked by:				
Approved by:				

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Fig. A-1-1 Lift Data Sheet (Cont'd)

EXAMPLE PRE-LIFT SAFETY CHECKLIST

Pre-Lift Check	Yes	N/A	Rigging Check	Yes	N/A	Crane Setup Check	Yes	N/A	Personnel Check	Yes	N/A
Payload weight / CG verified?			Correct rigging?			Annual inspection?			Lift director in place?		
Lift correctly categorized?			Rigging inspections current?			Daily checks conducted OK?			Qualified rigger in place?		
Plan in place?			Inspected before use?			Adequately supported?			Qualified signalperson(s)?		
Plan is viable?			Rigging correctly assembled?			Mats where required?			Communication (hand/radio)?		
Required approvals / permits?			Protection used as req'd?			Setup checked/level?			Operator certified/qualified?		
Weather / wind OK?			Rigging properly tagged?			Adequate parts of line?			Nonessential persons out?		
Power lines/undergrounds?			Sling angles acceptable?			Obstructions/clearance?			Rigger roles identified?		
Site control / area barricaded?			Lift points inspected?			Configuration correct?			Other craft roles identified?		
Contingency considerations?			*D/d* ratio adequate?			Controls / functions OK?			Rigging engineer present?		
Emergency plan needed?			Tag lines?			Services / ancillary eqpt.?			Pre-lift meeting held?		

PRE-LIFT BRIEFING

I confirm that the lift plan has been explained to me, that we have discussed it, and that I understand the operation and my role and responsibilities.

NAME (PRINT)	SIGNATURE	CRAFT/TRADE

NAME (PRINT)	SIGNATURE	LIFT DIRECTOR

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Fig. A-1-1 Lift Data Sheet (Cont'd)

CRANE LAYOUT (schematic)

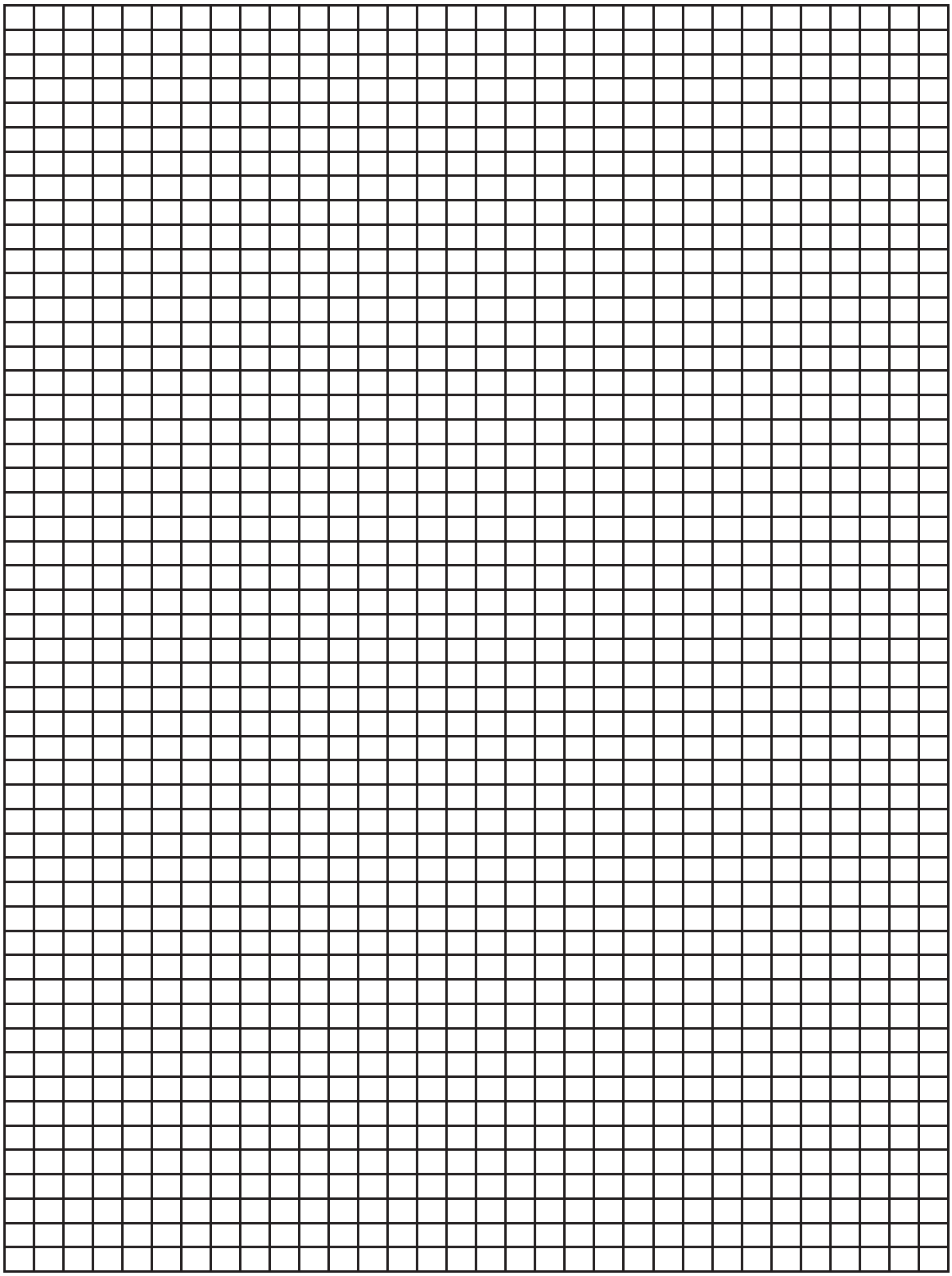

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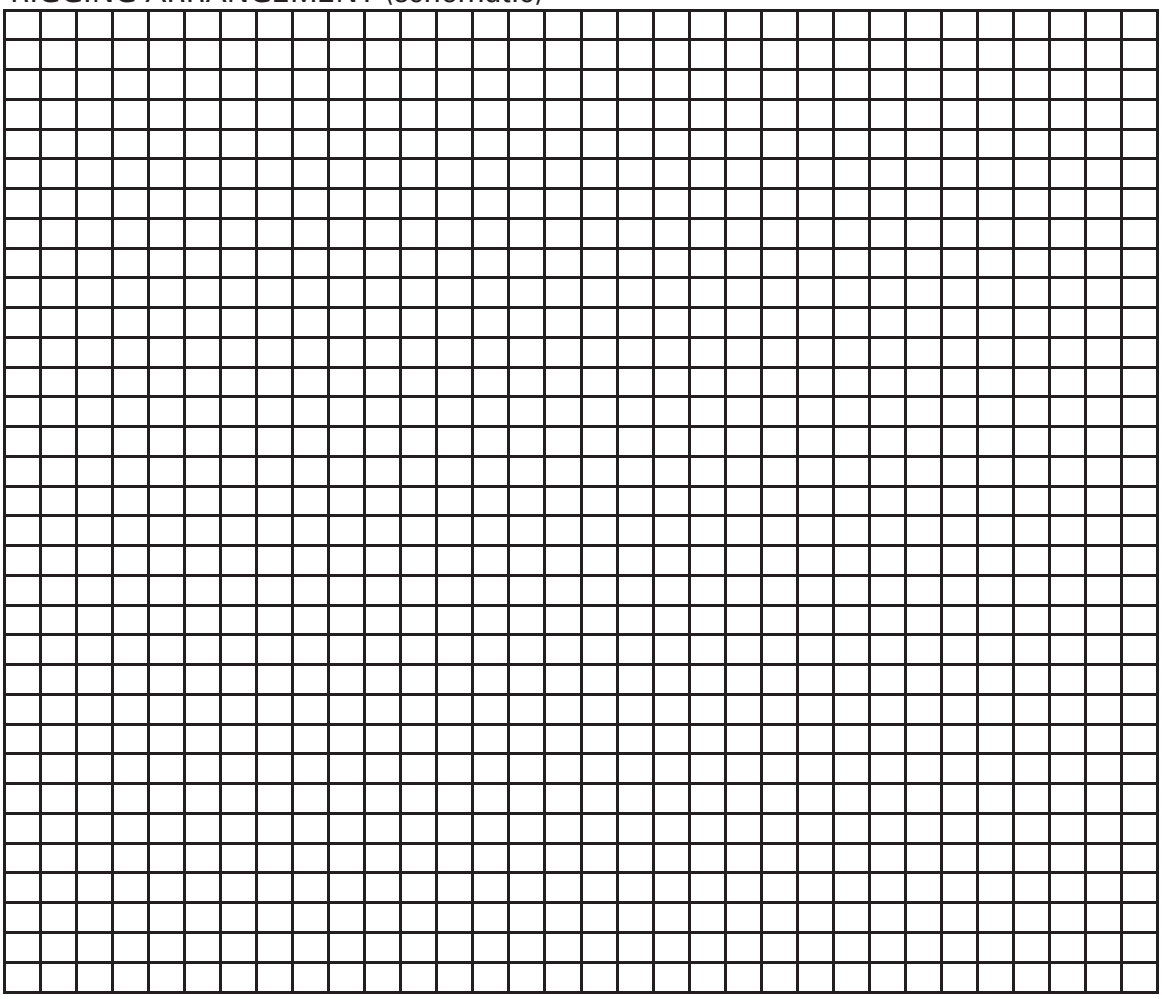
Fig. A-1-1 Lift Data Sheet (Cont'd)

RIGGING ARRANGEMENT (schematic)



LIFT SEQUENCE

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Fig. A-2-1 Example Lift Data Sheet (Single Mobile Crane Lift)

EXAMPLE LIFT DATA SHEET (Single mobile crane lift)

These numbers are for a specific lift. They are used as an example only and shall not be used for any other purpose. **#: Plan XXX**

Payload Name:	Truss T11	**Lift Description:**	Installation of 100 ft Boiler Truss		
Project:	Power Project			**Units:**	U.S. (ft-lb)

Crane Details — **Manufacturer:** XXXXX — **Model No.** XXX

Configuration:	Main, Luffer	Base Mount Type:	Crawlers	Track/outrigger c/s:	27.5 ft
Boom Type:	Lattice	Boom Length Used:	236.2 ft	Boom/jib angle:	85 deg
Jib Type:	Luffing	Jib Length Used:	137.8 ft	Tail swing:	54 ft
Machine ballast:	396,828 lb	Aux counterweight:	0 lb		
Block Cap'y:	400 ton	Line Size:	1.125 in.		
Single hoist line pull:	30,000 lb	Parts Line Used:	8	Reeved capacity:	240,000 lb
Heavy Lift Attachmts:	Tray	SL radius	49 ft	Superlift wt	220 ton

Load Details

	Quantity	Wt./each	Weight	Totals
Basic weight of item	1	140,427	140,427 lb	
Attached temporary scaffolding (set)	1	4,000	4,000 lb	
			lb	
			lb	
			lb	
Total weight of item to be lifted				**144,427 lb**

Rigging Data (size, type, and capacity)

3 in. bolt anchor shackle 85 ton WLL	2	154	308 lb	
2.5 in. bolt anchor shackle 55 ton WLL	2	98	196 lb	
3 in. bolt anchor shackle 120 ton WLL	2	178	356 lb	
52 ft span spreader 110 ton WLL	1	8,200	8,200 lb	
11 ft IWRC sling 2.5 in. dia. EIPS, 52 ton WLL @ 5:1 SF	2	325	650 lb	
52 ft-6 in. braided polyester round sling 67.6 ton WLL	2	500	1,000 lb	
			lb	
Total Rigging Weight				**10,710 lb**

Additional Weight Items

Main Hook	400t WLL	1	22,046	22,046 lb	
Hoist line (when applicable)	374 ft x 2.56 lb/ft x 8			7,660 lb	
Other Suspended Hooks	15t	1	1,205	1,205 lb	
Aux Boom Sheaves	none			lb	
Jib	none			lb	
Other	runner	1	2,205	2,205 lb	
Other (Aux. Hoist Rope)	40 ft x 2.56 lb/ft x 1			102 lb	
Total Additional Weight:					**33,218 lb**
GROSS LOAD (sum of all items above)					**188,355 lb**

Crane capacities

	Hoist	Place		
Total load to crane:	188,355 lb	188,355 lb		lb
Planned Radius:	84.0 ft	96.0 ft		ft
Chart Radius Used:	85.3 ft	98.4 ft		ft
Chart Capacity:	264,600 lb	246,960 lb		lb
% of chart capacity:	71.2%	76.3%		

THE MAXIMUM PERCENTAGE OF CHART CAPACITY PLANNED TO BE USED IS 76.3 %

Total suspended load (main): 184,843 lb **Reeved capacity:** 240,000 lb

THE MAXIMUM PERCENTAGE OF REEVED CAPACITY PLANNED TO BE USED IS 77 %

Document Attachments

☒	Crane layout	☐	Plan Categorization	☐	GBP source/calcs
☒	Rigging hookup arrangement	☐	JHA/JSA/AHA	☐	Project Scope
☒	Crane chart extract	☐	Risk Evaluation	☒	Load Weight/CG Source info
☒	Foundation details/calcs	☐	Wind/Weather Forecast	☐	Crane & Load Clearances
☐	Crane cribbing arrangement	☒	Drawing of load	☐	

Notes

Ground Bearing Pressure: Allowable: 16 ksf **Actual:** 14 ksf

Max. allowable wind speed: Allowable: 20 mph

Entire boiler pad area to be cleared of nonparticipants and barricaded during this operation.
Engineered Concrete Crane Pad is provided

	Name (Print)	Signature	Title	Date
Prepared by:				
Checked by:				
Approved by:				

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NONMANDATORY APPENDIX B
INDUSTRY REFERENCES

The following list of industry documents may be helpful to LHE owners, users, lift directors, site supervisors, and others involved in the planning and execution of load handling activities.

API 2D, Operation and Maintenance of Offshore Cranes

Publisher: American Petroleum Institute (API), 1220 L Street, NW, Washington, DC 20005-4070 (www.api.org)

ASCE 37-02, Design Loads on Structures During Construction

Publisher: American Society of Civil Engineers (ASCE), 1801 Alexander Bell Drive, Reston, VA 20191-4400 (www.asce.org)

ASME B30.1, Jacks, Industrial Rollers, Air Casters, and Hydraulic Gantries
ASME B30.2, Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)
ASME B30.3, Tower Cranes
ASME B30.4, Portal and Pedestal Cranes
ASME B30.5, Mobile and Locomotive Cranes
ASME B30.6, Derricks
ASME B30.7, Winches
ASME B30.8, Floating Cranes and Floating Derricks
ASME B30.9, Slings
ASME B30.10, Hooks
ASME B30.11, Monorails and Underhung Cranes
ASME B30.12, Handling Loads Suspended From Rotorcraft
ASME B30.14, Side Boom Tractors
ASME B30.16, Overhead Hoists (Underhung)
ASME B30.17, Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)
ASME B30.19, Cableways
ASME B30.20, Below-the-Hook Lifting Devices
ASME B30.21, Lever Hoists
ASME B30.22, Articulating Boom Cranes
ASME B30.23, Personnel Lifting Systems
ASME B30.24, Container Cranes
ASME B30.26, Rigging Hardware
ASME B30.28, Balance Lifting Units
ASME B30.29, Self-Erecting Tower Cranes
ASME NOG-1, Rules for the Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)
ASME NUM-1, Rules for Construction of Cranes, Monorails, and Hoists (With Bridge or Trolley or Hoist of the Underhung Type)

Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990; 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900 (www.asme.org)

ASSE A10.6, Demolition Operations
ASSE A10.7, Transportation, Storage, Handling, and Use of Commercial Explosives and Blasting Agents
ASSE A10.12, Excavation
ASSE A10.13, Steel Erection
ASSE A10.15, Dredging
ASSE A10.19, Pile Installation and Extraction Operations
ASSE A10.21, Safe Construction and Demolition of Wind Generation/Turbine Facilities (under development)
ASSE A10.26, Emergency Procedures for Construction Sites
ASSE A10.28, Work Platforms Suspended From Cranes or Derricks
ASSE A10.29, Aerial Platforms in Construction (under development)
ASSE A10.31, Digger-Derricks
ASSE A10.33, Safety and Health Program Requirements for Multi-Employer Projects
ASSE A10.34, Public Protection
ASSE A10.38, Basic Elements of a Program to Provide a Safe and Healthful Work Environment
ASSE A10.39, Construction Safety and Health Audit Program
ASSE A10.40, Reduction of Musculoskeletal Problems in Construction
ASSE A10.41, Equipment Operator and Supervisor Qualifications and Responsibilities (under development)
ASSE A10.42, Rigging Qualifications and Responsibilities in the Construction Industry
ASSE A10.47, Highway Construction Safety
ASSE A10.48, Communication Tower Erection (under development)

Publisher: American Society of Safety Engineers (ASSE), 1800 East Oakton Street, Des Plaines, IL 60018-2187 (www.asse.org)

CAN/CSA B354.1, Portable Elevating Work Platforms
CAN/CSA B354.2, Self-Propelled Elevating Work Platforms

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CAN/CSA B354.4, Self-Propelled Boom-Supported Elevating Work Platforms
CAN/CSA C225, Vehicle-Mounted Aerial Devices
CAN/CSA Z150, Safety code on Mobile Cranes
CAN/CSA Z150.3, Safety code on Articulating Boom Cranes
CAN/CSA Z248, Code for Tower Cranes
CAN/CSA Z271, Safety code for Suspended Elevating Platforms
CSA B167, Overhead Traveling Cranes Design, inspection, testing, maintenance, and safe operation

Publisher: Canadian Standards Association (CSA), 178 Rexdale Boulevard, Toronto, ON Canada M9W 1R3 (www.csagroup.com)

Construction Handbook for Bridge Temporary Works, 1st Edition, with 2008 Interim Revisions
Guide Design Specifications for Bridge Temporary Works, 1st Edition, with 2008 Interim Revisions
Manual for Bridge Evaluation, 2nd Edition, with 2011 and 2013 Interim Revisions
Standard Specifications for Highway Bridges, 17th Edition

Publisher: American Association of State Highway and Transportation Officials (AASHTO), 444 North Capitol Street, NW, Washington, DC 20001 (www.transportation.org)

ISA Z133.1, Arboricultural Operations Safety

Publisher: International Society of Arboriculture (ISA), P.O. Box 3129, Champaign, IL 61826-3129 (www.isa-arbor.com)

ITSDF B56.1, Low Lift and High Lift Trucks
ITSDF B56.6, Rough Terrain Forklift Trucks
ITSDF B56.7, Industrial Crane Trucks
ITSDF B56.10, Manually Propelled High Lift Industrial Trucks

Publisher: Industrial Truck Standards Developing Foundation (ITSDF), 1750 K Street, NW, Washington, DC 20006 (www.itsdf.org)

SIA A92.2, Vehicle-Mounted Elevating and Rotating Aerial Devices
SIA A92.3, Manually Propelled Elevating Aerial Platforms
SIA A92.5, Boom-Supported Elevating Work Platforms
SIA A92.6, Self-Propelled Elevating Work Platforms

Publisher: Scaffolding Industry Association (SIA), P.O. Box 20574, Phoenix, AZ 85036-0574 (www.scaffold.org)

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