

# INSPECTION HANDBOOK

## PIPING

## COMMENTARY

This handbook has been developed to assist the Field Engineer and inspector in their daily duties and provide them with the necessary data needed to make day-to-day decisions.

The issuance of this handbook is not intended to replace the codes or engineering specifications, but is used as a ready reference guide in conjunction with the project requirements.

It should be recognized that engineering specifications may be more restrictive than the standards used in the development of this handbook.

If there are differences between this handbook and the engineering specifications, the Engineering specifications shall govern.

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## General

No	Description
G-1	Construction Safety
G-2	Receiving And Storage
G-3	Concrete Expansion Anchors

## G-1 CONSTRUCTION SAFETY

The following characteristics of Construction Safety shall be reviewed:

### GENERAL

1. Check that workmen do not have to work in unsanitary or hazardous Conditions
2. Check that employees are instructed on specific procedures to follow when required to handle harmful substances
3. Check that employees working in confined spaces are advised of the hazards involved
4. Check that protective equipment is provided where necessary

### HOUSEKEEPING

1. Check that scrap with protruding nails is removed from work areas
2. Check that combustible scrap and Debris is removed at regular intervals
3. Check that containers are provided for waste, trash and oily rags
4. Check that covers are provided for Containers with hazardous or Flammable wastes

### MEDICAL SERVICES AND FIRST AID

1. Check that medical personnel are available for advice and consultation on occupational health matters
2. Check that equipment for prompt transportation of injured to a physician or hospital is available or that a communication system for calling an Ambulance is provided
3. Check that the telephone numbers of physicians, hospitals and ambulance service are conspicuously posted

### SANITATION

1. Check that containers for drinking water shall be so labeled,
2. Check that outlets for nonpotable water are labeled
3. Check that there is no connection between potable and nonpotable water supplies
4. Check that toilets are adequate and in proper order
5. Check that adequate washing facilities are provided for employees using paints, coatings

### OCCUPATIONAL NOISE EXPOSURE

1. Check that employees are given ear protection when noise levels exceed those permissible noise levels
2. Check that an effective hearing conservation program is administered where noise levels continuously exceed limits
3. Check that devices for ear protection will fit properly

## ONGOING RADIATION

1. Check that persons using x-rays or radioactive materials are qualified or licensed where necessary

## NONIONIZING RADIATION

1. Check that only qualified, trained personnel operate laser equipment
2. Check that laser safety goggles are provided where power is in excess of 0.005 watts and not exposed to intensities above those shown in this section
3. Check that areas where laser equipment is used are posted with warning signs
4. Check that laser is turned off when not in use
5. Check that laser beam is not directed at employees
6. Check that the laser is not used when it is raining, snowing, or when there is heavy fog or heavy dust in the air
7. Check that labels indicating power are shown on laser equipment
8. Check that laser beam is above heads where possible

## GASES, VAPORS, FUMES AND MISTS

1. Check that employees are not exposed to amounts in excess of “threshold limit values”
2. Check that any equipment or protective measures instigated to reduce containments are approved by a competent industrial hygienist unless, however, they can be removed by ventilation

## ILLUMINATION

1. Check that illumination in the following areas meets OSHA requirements:
  - Construction areas
  - Ramps
  - Runways
  - Corridors
  - Offices
  - Shops and storage areas

## VENTILATION

1. Check that the threshold limits values are not exceeded when fumes, mists, dusts are removed by ventilation
2. Check that exhaust systems do not draw harmful substances through work areas
3. Check that exhaust systems operate continually and are shut down in accordance with circumstances
4. Check that all ventilation systems for dusts, fumes, mists, vapors or gases are discharged to outside atmosphere

## HEAD PROTECTION

1. Check that head protection for employees exposed to high voltage is provided

## EYE AND FACE PROTECTION

1. Check that eye and face protection devices are provided
2. Check that adequate eye and face protection equipment is provided to prevent injury from physical, chemical or radiation agents
3. Eye-wash devices are properly located adjacent to hazardous chemical storage areas

## RESPIRATORY PROTECTION

1. Check that respirator protection devices are approved by the Bureau Of Mines
2. Check that employees required to use respirators are trained in their use
3. Check that respiratory equipment is inspected regularly and maintained in good condition
4. Check that used respiratory equipment is cleaned and disinfected before reissue

## SAFETY BELTS, LIFELINE

1. Check that safety equipment is used for employee safety only. Items used otherwise should be disposed of
2. Check that lifelines, safety belts have a minimum breaking strength of 5,400 pounds
3. Check that safety belts lanyard is no longer than 6 feet, and made of minimum 1/2 inch nylon

## SAFETY NETS

1. Check that safety nets are provided when work place is more than 25 feet above the ground, or water, and the use of platforms, scaffolds, ladders, temporary floors, safety lines, safety belts is impractical
2. Check that nets extend 8 feet beyond edge of work where employees are exposed
3. Check that nets are installed as close as possible to work and no more than 25 feet below working level over ground or water

## HAZARDOUS MATERIALS

1. Hazard Communication Program is available on site and is implemented

## FLAMMABLE AND COMBUSTIBLE LIQUIDS

1. Check that only approved containers, portable tanks, and metal safety cans shall be used for the storage and handling of flammable liquids
2. Check that temporary buildings shall not be placed where they obstruct exits
3. Check that temporary buildings shall be placed in another building shall be noncombustible or have a one hour fire Resistance rating
4. Check that buildings located outside shall be located not less than ten feet from another structure

5. Check temporary heating devices for clearance to combustible material (from heaters)
6. Check heaters on wood floors are placed on noncombustible material, extending a minimum of two feet on all sides
7. Check that clearance between heaters and tarpaulins, canvas or similar coverings shall be at least ten feet. Coverings shall be securely fastened to prevent contact with heater
8. Check temporary heating devices are equipped with pilot and automatic shut-off valve to prevent flow of fuel if flame goes out
9. Check that fluid used in hydraulic powered tools is fire-resistant

## SCAFFOLDS AND LADDERS

1. Check that portable ladders are tied, blocked or otherwise secured to prevent displacement
2. Check that ladders placed in passageways, doorways or in other areas where they may be displaced are protected by barricades or guards
3. Check that job made ladders providing the only means of exit for 25 or more employees are double cleated, and not more than 24 feet in length
4. Check that ladder cleats are inset into side rails 1/2 inch, or filler blocks are placed between cleats
5. Check that standard guard rails and toe boards are provided on all scaffolds that are ten feet or more above ground or floor. Standard guard rails shall be 2"x 4" (or equivalent) 42" high (minimum) width 1" x 6" mid-rail and toe boards a minimum of 4" in height. Sizes refer to nominal or dressed dimensions.
6. Check that scaffolds that must be passed or worked under are provided with screen from toe board to guardrail
7. Check that overhead protection is provided for men on a scaffold exposed to overhead hazards
8. Check that scaffold planks extend not less than 6 inches nor more than 12 inches, and are of scaffold grades material
9. Check that floor openings are guarded with standard handrails. A floor opening is a hole 12 inches or more in its least dimension through which a person can fall.
10. Check that runways are provided with standard rails and toe boards when they are 4 feet or more above the ground
11. Check that when work is to be performed in a manhole or non vented vault, no entry shall be made until forced ventilation is provided or the atmosphere is tested and found safe
12. Check that when work is being done in a manhole, an employee shall be available in the immediate vicinity for assistance

## EXCAVATION, SHORING AND TRENCHING

1. Prior to excavation, shoring and trenching operations review for gas lines, conduit, etc., or any other underground structure to be avoided
2. Atmospheric conditions tested, where necessary
3. Adjacent structures shored
4. Land shored and sheathed as needed for soil and depth
5. Roads and sidewalks supported and protected
6. Banks more than five feet shored or sloped to angle of repose



7. Ladders or stairs provided as required (trenches four feet deep or grates require ladder for every 25 feet of lateral travel)
8. Equipment ramps adequate, slope not too steep

#### HOISTS, CRANES AND DERRICKS

1. Cables and sheaves free of excessive wear and abrasions
2. Slings and chains, hooks and eyes, have no evidence of defects, excessive wear Or damage
3. Power lines inactivated, removed, or at safe distance as required by provincial regulations
4. Area barricaded or roped off where necessary

## G-2 RECEIVING AND STORAGE

The following characteristics of receiving and storage shall be reviewed:

1. Check for loading and shipping damage material and equipment is free of damage caused by fire or high temperatures, excessive weather exposure, environmental damage, tie down failure or rough handling
2. Inspection of components shall be performed in a manner to avoid contamination of the item during inspection
3. Check that material and equipment conforms to size, type, quantity and configuration as specified in the purchase order documents and detail drawings
4. Review the supplier's documentation for identification and feasibility to the marking and tagging on the received material, equipment, components and devices
5. Promptly identify and expedite all shortage items and initiate repairs or replacement for damaged items
6. Avoid double handling of equipment and components by checking shipping and erection schedules. Unload and transport directly to erection areas, where possible
7. Arrange storage so that parts can be located easily. Provide full crane, truck, and rail access to storage areas.
8. Systematize and record all storage locations. Segregate damaged or rejected materials
9. Follow manufacturer's instructions and/or approved procedures when unloading, rigging, handling And transporting components from rail cars or trucks to storage (see Rigging Inspection Handbook)
10. Store instruments, electrical equipment, weld rod, insulation and other items, requiring protection from the elements indoors. Provide numbered bin storage. Provide dry storage for weld rod. Set up weld rod controls.
11. Perform user's acceptance, test, where required
12. Perform equipment maintenance, when required
13. Check that the vendor's storage and preservation requirements are followed
14. Special provisions are in place for storage of hazardous materials

### G-3 CONCRETE EXPANSION ANCHORS

The following characteristics of expansion anchor installation shall be reviewed:

#### GENERAL:

1. Select the proper anchor from Table 1 based on the design drawing requirements and the thickness of the material
2. Determine the hole depth from Table 1 For Hilti, Phillips and Ramset anchors. Depth of hole is measured from the surface of the fixture being anchored

Note: When the hole is measured from the concrete surface, subtract the thickness of the fixture and any voids, grout or shims beneath the fixture

#### PRE-INSTALLATION SET-UP:

1. Prior to drilling for anchor installation, review the rebar placement drawings for the intended anchor installation
2. Using the rebar finder, scan the concrete surface and locate the reinforcing steel, mark-up the bar location on the concrete surface
3. If rebar will be encountered at anchor location, contact discipline engineer to see if the base plate or expansion anchor can be relocated
4. If base plate or expansion anchor cannot be relocated, contact the designated field engineer to see if rebar can be cut
5. When permission from the designated Field Engineer is given to cut a rebar, the depth of the concrete cover or the rebar should be checked and longer anchors installed, if necessary, to ensure that the wedge of the anchors do not sit on the sides of the cut rebar

#### INSTALLATION:

1. All holes shall be drilled with masonry bits of the same diameter as the anchor. If rebar is encountered, stop further drilling and follow pre-installation instruction.
2. Blow out loose dirt and filing prior to installation of the anchor
3. Only after all the holes for a given installation have been drilled should the anchors be installed
4. With the nut on, and slightly raised so not to damage the threads, hammer the anchor into the hole with the fixture in place before torquing, engage the nut as far as possible. The, installation torque values are given in Table 1.
5. Maximum deviation of the anchor bolt from perpendicularity with concrete surface should not exceed 5 degrees
6. Full thread engagement on the nut is required. Installation torque may be exceeded to achieve full thread engagement.
7. Minimum center to center spacing and edge distance are as specified on the design drawings

8. If a nut bottoms out (runs out of threads) prior to reaching proper torquing, additional steel washers may be used to maintain proper torque provided minimum embedment is maintained
9. Leveling nuts or pipe shims shall not be used on an anchor unless specified on the design drawing
10. Alterations to expansion anchors such as cutting, threading or machining is prohibited

#### EXPANSION ANCHOR TEST PROCEDURE:

1. Expansion type concrete anchors shall be tested to the values in Table 1 using a calibrated torque wrench
2. Expansion anchors that fail torque test shall be repaired as required and re-torqued and re-inspected
3. For shell type anchors (drop-in) check for the following:
  - Setting plug is present
  - Anchor setting tool of 1-3/4" minimum shank length is flush with and has full contact with the top of the anchor shell
  - Bolts or threaded bars inserted into anchor shells have thread engagement equal to the threaded depth of the anchor shell

#### REPAIR OF ANCHOR FAILURES:

1. Failure Due To Concrete Breakout - anchors may be reinstalled provided that the regained embedment beyond breakout depth. Concrete that is damaged shall be removed to sound concrete and repaired (see concrete repair checklist)
2. Failure Due To Anchor Breakage - anchors shall be drilled out, and provided that the integrity of the surrounding concrete is maintained, the hole redrilled and next larger size diameter anchor installed in the same location. The replacement anchor embedment length shall be at least equal to the minimum embedment for the next larger anchor.
3. Failure Due To Anchor Slippage Or Torque - anchors may be reoriented and retightened once for test. If the anchor cannot be torqued the anchor shall be removed, provided the integrity of the surrounding concrete maintained, the next size anchor replaced as noted in (2) above.

Table I

Torque Value for Hilti, Phillips, and Ramset Expansion Anchors

Anchor Size (Inches)	*Verification Torque Values (ft/lbs)	Bechtel Installation Torque (ft/lbs)
1/4"	9	10
3/8"	24	30
1/2"	45	55
5/8"	75	85
3/4"	100	115
1"	254	310

\*Values include  $\pm 4\%$  error for torque wrench calibration

1. Bechtel installation torque values are to be used as guidelines to ensure that verification torque values are met. Installation torque values were chosen from the recommended range of torque values that consistently pre-set the anchors to 150% of their working loads.

## Piping

<u>No</u>	<u>Description</u>
P-1	General Piping
P-2	Large Piping
P-3	Small Piping
P-4	Embedded Piping
P-5	Valves
P-6	Hangers and Supports
P-7	Flushing and Cleaning
P-8	Leak Testing
P-9	Protective Coatings
P-10	Pipe Insulation

## P-1 GENERAL PIPING

The following characteristics of general piping shall be reviewed:

### RECEIVING

1. Check that material is properly Prepared and/or packaged
2. Check material for proper identification; permanent tags are fixed to valves as specified
3. Inspect for damage
4. Verify quantities received
5. Inspect for cleanliness
6. Verify that the required documents are received with shipment
7. Verify that all items that do not conform to specified requirements are properly segregated and/or processed

### STORAGE AND HANDLING

1. Review need for any special processing
2. Check that storage and handling is in accordance with procedures, specifications, and/or special instructions
3. Verify that cleanliness is maintained during storage

### FABRICATION

1. Check areas where material will be installed for interferences and resolve prior to fabrication (i.e., structural steel cross bracing)
2. Verify that current revision of drawings are being used for fabrication
3. Verify that proper material has been requisitioned from storage
4. Inspect for cleanliness
5. Verify proper storage and identification of fabricated materials
6. Assist in determining rigging and material handling equipment requirements
7. Verify that openings on vessels, tanks, etc., are properly identified

### EXCEPTIONS

1. Exceptions identified that do not conform to contract drawing or specification requirements and cannot be satisfactorily resolved, should be reported on the Daily Construction Report

### SYSTEM PUNCH LIST

1. walk the system or portion of the system assigned to determine completion status, using appropriate system and design drawings
2. Prepare a punchlist by listing all:
  - Items that do not conform to contract requirements
  - Items that are not complete

3. Verify completion of punchlist items when reported complete
4. Update and reissue as necessary



## P-2 LARGE PIPING

The following characteristics of large pipe shall be reviewed:

1. Design drawings have been reviewed for constructability, interferences, problems for erection, and scheduling
2. Installation preplanning has been done. Review general piping checklist.
3. Receiving inspection has been performed
4. Material is properly stored and maintained
5. Periodic material inventories are performed and that material is reordered as necessary
6. Building areas have been checked for possible interferences
7. All required wall and floor sleeves and openings are provided prior to concrete placement
8. Changes are monitored and incorporated on the drawings
9. The work is being performed in accordance with applicable work instructions or procedures
10. Exception reports are properly prepared and processed
11. Changes that may result in interferences and/or cause delays are coordinated with other disciplines
12. Other discipline design drawings are reviewed for familiarity and for possible interferences
13. Installed pipe has been released for testing
14. Post test punch lists complete and pipe released for insulation, as specified
15. Completed system has been released to startup

### P-3 SMALL PIPING

The following characteristics of small pipe shall be reviewed:

1. Installation pre-planning has been done. Review general piping checklist
2. Small pipe to be field routed has been determined
3. Small pipe to be detailed on field prepared isometrics has been determined
4. Preparation of small pipe layout and isometric drawings have been completed
5. Building areas have been checked for interferences prior to preparation of isometrics
6. Required receiving inspection has been performed
7. Pipe and fittings are properly marked, identified and stored
8. Required wall and floor sleeves and openings have been provided prior to concrete placement
9. Drawing changes are monitored and incorporated in drawings
10. Required work instructions or procedures have been prepared
11. Work is being performed in accordance with work instructions on procedures
12. Exception reports are being properly prepared and processed
13. Other discipline design drawings are reviewed for familiarity and possible interferences
14. Changes to avoid interferences and possible delays are coordinated with other disciplines
15. Installed piping has been released for testing
16. Post test punch lists complete and pipe released for insulation, as specified
17. Completed piping system has been turned over to startup

## P-4 EMBEDDED PIPING

The following characteristics of embedded piping shall be reviewed:

1. Installation preplanning completed
2. Embedded piping installation schedule is compatible with concrete placement schedule
3. Material receiving inspections have been performed
4. Embedded pipe, fittings, and associated material is properly marked, identified, and stored
5. Material that does not conform to design requirements is properly segregated and/or processed
6. Embedded piping requiring coating and wrapping has been determined
7. Areas have been checked for interferences with reinforcing bar, structural steel and forming
8. Piping is located in plan, elevation, and scope in accordance with the drawings
9. Any installation deviations are reflected on "as-built" drawings
10. Piping is properly supported and secured against movement during embedment
11. System or partial system has been pressure tested and accepted prior to embedment
12. Connection piping can be erected and pressure tested
13. All openings in the system (e.g., floor drains, equipment drains, connecting piping joints) have been sealed and any valves in the vicinity of the concrete placement or backfill have been protected for cleanliness against damage

## P-5 VALVES

The following characteristics of valves shall be reviewed:

1. Installation preplanning has been done. Review general piping checklist.
2. Receiving inspection has been performed
3. Valves are properly handled, stored and maintained
4. Building areas are checked for interferences with valves installation and operation
5. Valves are correct size, type, pressure rating and installed in their correct location and orientation
6. Valve installation in-process inspections are being performed
7. Valve installation progress reporting system is maintained
8. Periodic valve inventories are performed and field purchased valves are reordered if necessary
9. P&ID drawing changes are monitored and incorporated in appropriate layout drawings
10. Extra valve stem packing, bonnet gaskets, pressure seals, plugs, and flange gaskets needed for repairs are available
11. Piping design drawings and vendor valve detail sheets are reviewed for compatibility including material and end preps
12. Required operating and setting instructions and procedures are prepared
13. Operating and setting activities are performed in accordance with applicable instructions, procedures and valve/operator manufacturer's instructions
14. Changes that may result in interferences and/or delays are coordinated with other disciplines
15. Exception reports are properly prepared and processed
16. Required valve operator supports are installed
17. Measures are taken to protect valve bodies and internals from heat effects of welding

## P-6 HANGERS AND SUPPORTS

The following characteristics of hangers and supports shall be reviewed:

1. Installation preplanning has been done and is compatible with piping installation planning
2. Receiving inspection has been performed
3. It has been determined which hangars will be field fabricated and which will be vendor supplied
4. Hanger structural attachment locations are surveyed and identified
5. Installation areas are checked for possible interference
6. Hanger fabrication and installation is scheduled to precede piping installation
7. Spring hanger travel stops remain in place during installation, testing, and until system hanger checkout is performed
8. Hangers and supports are installed in accordance with detail drawings and within the tolerances allowed in specifications or procedures
9. The latest approved revision of drawings are being used for fabrication, installation and checkout
10. P&ID and piping drawing changes are monitored and incorporated on the support drawings
11. All required exception reports are properly prepared and processed
12. Provisions have been established to protect shock suppressor intervals and reservoir when disassembling for repair or refilling
13. Changes that may result in interferences or delays are coordinated with other disciplines
14. Hanger and support checkout is performed in accordance with specifications and/or procedures

## P-7 FLUSHING AND CLEANING

The following characteristics of flushing and cleaning shall be reviewed:

1. Procedures are developed and approved indicating flushing and cleaning sequence steps to be performed
2. All welded connections are complete and the system/subsystem is released for flushing and cleaning operations
3. Flushing is not carried out through any machinery or equipment that may be damaged by such flushing
4. Line debris is not flushed into deadends or associated vessels
5. Heat exchangers are isolated wherever possible until initial flushing is complete
6. Orifice plates and flow-nozzles are removed from the line
7. That if a cleaning solvent is used, there are no materials in the system that could be damaged by its use
8. That temporary spacers or spool pieces are provided where necessary to avoid straining the pipe where items have been removed
9. All high points are sufficiently vented to ensure that the cleaning solution will contact all inside surfaces of the pipe
10. Sufficient bypasses are installed to ensure the flow of the cleaning solution through all desired parts of the system
11. Adequate venting is provided to prevent vacuums forming in the system
12. Maintain surveillance of the flushing and cleaning operation ensuring that all steps of the procedure are performed

After cleaning, passivating and flushing are complete, and the system has been drained and dried:

1. Inspect all accessible points of the system to ensure that it is free of scale, rust, loose paint and film and is of correct surface appearance
2. Check that all removed items are correctly reinstalled
3. If testing is not to be performed immediately, ensure that the piping is sealed
4. Make regular inspections after cleaning to ensure the piping is kept sealed
5. Where specified for critical components or systems, nitrogen blanket is re-established in accordance with manufacturer's instructions and project procedures

## P-8 LEAK TESTING

The following characteristics of leak testing shall be reviewed:

### Prerequisites

1. Pre-test inspection is performed by walking down the system and verifying accessibility for inspection, completeness in accordance with the latest P&IDs, tightness of flanged joints and chalking of joints, as applicable
2. The test medium, test pressures, and test boundaries have been established for each test, including blind thickness determinations
3. Test boundaries are properly tagged in accordance with approved procedures and as specified
4. Test medium, sampled and tested where specified, to determine if it is acceptable/detrimental to vessel internals
5. Test gauges are calibrated before issuing for use
6. Test gauges are checked against a master gauge for accuracy prior to returning to storage or reissuing for use
7. Test gauges are calibrated by a qualified instrument laboratory
8. Test gauges are calibrated periodically in accordance with codes, procedures, and specifications
9. Test gauges have a calibration range of not less than 1-1/2 times and not more than 4 times the intended maximum test pressure
10. Items incapable of safely sustaining test pressures are removed or isolated from the system
11. Systems requiring lay-up after testing have been established and the lay-up medium to be used has been determined
12. It has been established which system will or will not require draining after testing
13. All required test vents and drains are installed and fill points are established
14. The required testing equipment, relief valves, pressure regulators, valves, strainers and temporary pipe and fittings are available
15. All system valves are positioned as required
16. System relief valves have been gagged or removed, as required
17. The system is adequately supported for expected loading during testing
18. Test equipment and temporary piping have been flushed prior to connection to system
19. Systems have been flushed prior to testing, if required
20. Required test witnesses (such as quality control, authorized code inspector, client representative, etc.) are notified in advance of scheduled test

## Leak Testing

1. Only system released for testing are tested
2. Testing is performed in accordance with approved procedures and specifications
3. Testing is performed by qualified personnel
4. Personnel safety is exercised throughout testing
5. The proper test medium is used
6. The test medium is at proper temperature, as applicable
7. System pressurization stages are maintained, if required
8. The system is held at required pressure for the specified time before inspecting for leaks
9. Testing progress charts are maintained
10. Tested systems are properly vented and drained for laid-up, and/or properly restored for turnover to start-up
11. Documentation forms are prepared in accordance with approved procedures and specifications
12. Documentation forms are completed and accurate
13. Documented tests are witnessed when so required, and documentation forms bear authorized witness signatures



## P-9 PROTECTIVE COATINGS

The following characteristics of protective coating shall be reviewed:

1. Verify proper storage of priming, coating and wrapping materials. Materials that show evidence of deterioration or damage should not be used
2. Prior to starting coating activities, verify the following:
  - All hydrostatic and non-destructive testing specified has been performed
  - Surface preparation performed as specified (i.e., solvent cleaning, hand tool cleaning, power tool cleaning, blast cleaning, as applicable)

### Priming

1. Verify that the specified protective coating materials drawn from storage are of the correct type and quantity, are in good condition, within shelf life requirements, and are compatible with intended service (e.g., high temperature, corrosive)
2. Surface is cleaned and free of moisture prior to application of primer
3. Primer is mixed in accordance with manufacturer's instructions
4. Check that the primer coat is uniform and free of "floods, 'runs or "holidays"
5. Verify that the primed surface is adequately protected when supported by skids, earthen berms, etc.
6. Where the surface has been pre-primed, check the integrity of the primer coating and initiate any necessary repairs

### Coating And Wrapping

1. Check that the primed surface is free of any foreign matter or moisture prior to application of the coating
2. Verify that weather and temperature conditions are suitable
3. Verify that the application of coating and wrapping material is according to manufacturer's directions and compatible with existing coating
4. When spiral weld pipe is used, check that the raised weld seams are properly coated to prevent voids under the tape coating
5. Verify that all valves and fittings are coated as required by design documents
6. Ensure that electrical holiday testing is accomplished as required
7. Check that repairs are made and retested in accordance with design requirements

## P-10 PIPE INSULATION

The following characteristics of pipe insulation shall be reviewed:

1. Maintain surveillance of the storage conditions of the insulation materials
2. Check that material drawn from storage for application is dry and undamaged
3. Verify that all required hydrostatic and non-destructive testing has been performed prior to application of insulation
4. Ensure any required surface coating has been applied
5. Pipe surface is free of moisture prior to application of insulation
6. Check that correct type and thickness insulation is applied
7. Check that the support fittings (e.g., banding straps, “s” and “j” cups) are of the proper material
8. Where a vapor barrier is required, check that it is correctly applied to the proper thickness and that its integrity is maintained throughout
9. Check that protective metal coverings are applied in a manner that underlying insulation or vapor barrier is undamaged
10. Ensure that piping or equipment supports do not damage the insulation
11. To isolate the effects of a break-in insulation or vapor barrier. The barrier should be sealed to the pipe at every fitting and supports.
12. All removable vessel heads and manways should be fitted with removable insulation
13. when abrasive insulation material such as cellular glass is used on lines or equipment subject to vibration, the inside surface should be coated to prevent damage to the lines or equipment
14. When more than one layer is to be applied, check that:
  - All joints of the previous layer are sealed prior to application of the next layer
  - All joints between one layer and another are “offset”
15. When insulation is beveled or otherwise terminated, the moisture barrier should be folded over the end of the insulation and sealed
16. Where insulation abuts flanges that are not to be insulated, the insulation should be beveled a sufficient distance from the flange to permit removal of flange bolts without damage to insulation