TECHNICAL SPECIFICATIONS

FOR

INDUSTRIAL TRACKS

VICE PRESIDENT - ENGINEERING
DENVER, COLORADO 80206

Revision Date: 9/2015

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This manual covers technical specifications for OmniTRAX Inc. and its subsidiaries. All references in this manual to "OmniTRAX" mean OmniTRAX Inc. and its subsidiaries.

Revision Date: 9/2015

1. PREFACE

The information contained herein is intended to provide guidance for your planning and construction of an OmniTRAX company rail-served facility. OmniTRAX makes a commitment to you to develop an efficient, cost-effective rail served facility that meets your rail transportation requirements.

Additional components of your project may include but not be limited to public and private road crossings, utilities at your site as well as those already located on OmniTRAX property and governmental permits, requirements and approvals.

This technical manual and its drawings will be revised periodically. It is the responsibility of the user to update their copy with the most current information.

2. OVERVIEW

The first step is to contact the appropriate Marketing and Sales representative for assistance. If the customer has not already done so, the customer will need to select a ***qualified*** rail engineering consultant for the project. If requested OmniTRAX will the contact information for a qualified rail engineering consultant. The Marketing and Sales representative will provide the customer with a milepost (MP) of a permanent facility in the vicinity of the project that will help the customer's consultant establish MP control to the turnouts and other important features to be identified on the drawing. The qualified rail engineering consultant will need to obtain a Right of Entry permit from OmniTRAX prior to gaining access to the OmniTRAX controlled property to allow compliance with the Federal Railroad Administration's regulations. A Right of Entry – Non Environmental Application may be obtained at http://www.omnitrax.com/services/real-estate.

All drawings and plan sets are to be submitted to the Vice President – Engineering electronically as an Adobe PDF for review, comment and approval. Along with the drawing and plan submittal a brief description should accompany the submittal describing the following (additional information may be required):

a) Purpose of the track, storage, loading onto or out of?
b) Length(s) of rail cars expected to be worked on or along the track?
c) Maximum number of rail cars anticipated to be placed on the track(s) at any one time?
d) Placement of any equipment either overhead or along the side of the rail cars?
e) Access to the rail cars, single side, both sides?
f) At grade crossing(s) required?
g) Type of commodity to be transloaded, is it flammable?
h) Hydrology/hydraulic study to ensure adequate drainage structure sizes.
i) If site drains toward OmniTRAX controlled property ensure no additional water (velocity) is directed toward the railroad, may require detention facilities.
j) Management of water adjacent to the track(s)?
k) Any dimensional (high/wide) commodities?

The customer, or customer's consultant, will also need to prepare and submit an exhibit print that includes a track plan that will be inserted into the Industrial Track Agreement (ITA). After all issues are resolved, the project will receive final approval, a cost estimate will be generated and both parties will sign an Industry Track Agreement.

Construction Guidelines

Prior to performing any construction on an OmniTRAX property, the following must occur:

a) A fully executed Industry Track Agreement is in effect.
b) The designated OmniTRAX representative must be notified in writing at **least ten (10) working days** prior to start of construction to allow the

appropriate safety precautions to be taken. Any flagging protection provided by an OmniTRAX property will be at customer expense.

c) The customer's contractor is responsible for securing any and all dig permits for all work including any utility work within the project work limits from the appropriate call before you dig service.

The industrial track(s) must be constructed pursuant to the approved plans; written approval for any changes must be obtained prior to construction from the Vice President - Engineering. Contractor(s) must abide by the **Minimum Safety Requirements for Contractors Working on Railroad Controlled Property**. Upon completion of the entire rail project, the Vice President - Engineering must be contacted for inspection and final approval of all grading and track work. On the rare occasion that the actual track construction differs from the originally approved design, the Railroad will require "as built" drawings from the customer. The "as built" drawings will show the corrected stationing, geometry, structures, and clearances. The Industry Track Agreement will then be amended.

Costs Associated with Track Construction

All design, engineering, and construction are at the customer's expense, **including "On Track Safety" flagging protection**. Grading construction includes clearing and grubbing, all required embankment and excavation, overhead and underground utilities and their adjustments, the installation or extension of drainage facilities or structures under or along the proposed trackage, soil stabilization and placement of subballast on and off OmniTRAX controlled property. Track construction will include but is not limited to rail, ties, ballast, turnouts, road crossings, miscellaneous track material, and all labor.

Road Crossings

As a general policy, OmniTRAX discourages the construction of new public or private roadway grade crossings. If the construction of a new roadway grade crossing across an OmniTRAX controlled tracks, written approval will be required from the Vice President - Engineering and any applicable State Regulatory Agency. If approved, a separate crossing agreement may be required. The customer will be responsible for obtaining all permits associated with the crossing of any public or private roadway. Grade crossings may require the installation of automated grade crossing warning devices. All cost(s) associated with the grade crossing surface(s) and signals will be at the customer's expense.

Materials for Track Construction

All materials used for the construction of the proposed track must meet the standards as provided herein. Customer shall have their rail contractor furnish all material including that to be utilized on the OmniTRAX controlled property.

3. TYPICAL SPECIFICATIONS FOR DESIGN AND CONSTRUCTION OF INDUSTRIAL TRACKAGE

All design and construction shall be governed by these specifications, Engineering Standards, Engineering Instructions and other drawings incorporated in or referenced in these specifications. Any items not covered specifically herein shall be in accordance with American Railway Engineering & Maintenance of Way Association (AREMA) Recommended Practices, subject to approval by the Vice President - Engineering or his authorized representative. Where conflict exists between these specifications and the recommended practices of AREMA, these specifications shall govern. In addition, construction must adhere to all Federal Railroad Administration and applicable State and Local requirements.

These specifications are provided only as a guideline for design and construction of private railroad tracks and their supporting roadbeds and should not be taken as authority to construct without prior review and approval by the office of the Vice President - Engineering of OmniTRAX Inc. and the President of the individual railroad involved.

All walkways must conform to the OmniTRAX Inc. specifications and/or the federal, state or local regulations whichever is the most protective from the standpoint of the public safety. Industries shall be responsible for the proper construction and maintenance of walkways in the state where tracks are constructed.
This manual covers technical specification for OmniTRAX Inc. and its subsidiaries. All references to this manual to "OmniTRAX" means OmniTRAX Inc. and its subsidiaries. These specifications supersede all previous Specifications for Industrial Tracks and are subject to revision without notice.

OFFICE OF VICE PRESIDENT - ENGINEERING

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4. MINIMUM SAFETY REQUIREMENTS FOR CONTRACTORS AND NON-RAILROAD EMPLOYEES

Safety of personnel, property, rail operations and the public is of paramount importance in the performance of work. As reinforcement and in furtherance of overall safety measures to be observed by the Contractor (and not by way of limitation), the following safety rules shall be observed:

4.1 The Contractor shall keep the job site free from safety and health hazards and ensure that its employees are competent and adequately trained in all safety and health aspects of the job. The Contractor shall have the proper first-aid supplies available on the job site so prompt first-aid services can be provided to any person that may be injured on the job site. The Contractor shall promptly notify the Railroad of any U.S. Occupational Safety and Health Administration reportable injuries occurring to any person that may arise during work performed on the job site. The Contractor shall have a non-delegable duty to control its employees, while they are on the job site or other property of the Railroad, to be certain they do not use, be under the influence of, or have in their possession any alcoholic beverage or illegally obtained drug, narcotic or other substance.

4.2 The employee of the Contractor shall be suitably dressed to perform those duties safely and in a manner that will not interfere their vision, hearing or free use of their hands or feet. In addition, the Contractor shall require its employees to wear personal protective equipment as specified by Railroad rules, regulations or Railroad officials overseeing the work at the job site. In particular, the protective equipment to be worn shall be:

4.2.1 Protective head gear that meets American National Standard 289.1 – latest revision. It is suggested that all hard hats be affixed with the Contractor's or Subcontractor's company logo or name.

4.2.2 Eye protection that meets American National Standard 287.1 – latest revision, for occupational and educational eye and face protection. Additional eye protection must be provided to meet specific job situations such as welding, grinding, burning, etc.

4.2.3 Hearing protection which affords enough attenuation to give protection from noise levels that will be occurring on the job site.

4.3 All heavy equipment provided or leased by the Contractor shall be equipped with audible backup warning devices.

4.4 If, in the opinion of the Railroad Representative, any of the Contractor's or any of its subcontractors equipment is unsafe for use on the Railroad's right of way,

the Contractor, at the request of the Railroad Representative, shall remove such equipment from the Railroad's right of way.

4.5 If the Railroad Representative has given the Contractor permission to use certain equipment on any trackage at the job site, the Contractor shall ensure that each and all of its employees responsible for operating such equipment, including without limitation any hi-rail equipment on any trackage of the Railroad, will be trained to know and understand, and will comply with, the Railroad's operating rules applicable to the operation, including main track authority and use of such equipment.

4.6 In the event the Contractor's employees use any such equipment to move any rail-cars or other rail-bound equipment equipped with air brakes, the Contractor shall further ensure that the employees are trained to know and understand, and will comply with, the Railroad's rules for handling such equipment and cars, and that the Contractor's employees perform all required tests of the operating systems of any equipment and cars before, and after movement. If the equipment being operated falls under the provisions of CFR 49 Part 240 as a locomotive, a qualified locomotive engineer shall operate it at all times.

4.7 In live track operations, a distance of twenty five (25) feet from the track must be maintained unless the contract necessitates working in close proximity to the track. When doing so, the Contractor's employees and equipment must have authorization from the Railroad. Where work is in close proximity to the tracks, a Railroad flagger must be present or arrangements made with the Railroad for proper protection of the work operation.

4.8 Contractor's employees must be familiar with procedures to clear persons and equipment from track area for approaching trains. In addition, the following safety procedures shall be adhered to by all of the Contractor's employees:

4.8.1 Always be on the alert for moving equipment while working on or near any railroad tracks or facilities.

4.8.2 Do not step or walk on the top of the rail, frog, switches, guardrails or other track components.

4.8.3 In passing around ends of standing cars, engines, railroad machinery and other on-track equipment, leave at least twenty (20) feet between yourself and the end of the equipment and fifty (50) feet between cars on the same track.

4.8.4 Avoid walking foul or standing foul of the track at any time.

4.8.5 When it is necessary to walk or work on the track, always keep a sharp lookout in both directions for approaching trains.

4.8.6 Before stepping over or crossing tracks, look in both directions first and then proceed in single file when walking in groups.

4.8.7 Do not sit on, lie under, or cross between cars except as required in the performance of your duty and only when track and equipment are under proper protection.

4.8.8 In multiple track territory, do not stand on one track while a train is passing on another.

4.8.9 When workers and or equipment must clear the track for trains, be sure not to stand in the area of switches and at least twenty five (25) feet from the nearest rail if safe to do so.

4.9 Contractor will have a Roadway Worker Plan for use on the property while working within four (4) feet of the outside of the rail. Cost for flagging services at any time there is customer/contractor activity within twenty five (25) feet of the centerline of a track is the responsibility of the customer/contractor.

5. DESIGN INFORMATION REQUIRED

The following information shall be required for the design of the industrial track(s).

5.1 PLAN VIEW

5.1.1 Geometry – Label all geometric points including but limited to Points of intersection.

5.1.2 Proposed curve data with stationing, intersection angle, degree of curve (chord definition), delta, tangent distance, length of curve and curve radius. Curve points to be clearly identified noting point of curve (PC), point of tangent (PT) with a standard curve point symbol.

5.1.3 Existing available curve information within 500' of the project limits showing approximate curve points with a standard curve point symbol.

5.1.4 Station the beginning and ending points of all existing and proposed work limits.

5.1.5 Each track shall be stationed beginning with 0+00 at the point of switch increasing in the direction of the railroad mileposts.

5.1.6 Each turnout shall consist of two stations one for the through/straight movement and one for the turnout/diverging movement.

5.1.7 Track Elements – Label all track elements with their respective track stationing and material notes such as size, weight of rail, type, hand of existing and proposed turnouts, type of derail, and type of end of track device. Existing elements within three hundred (300) feet of the proposed project limits.

5.1.8 Existing and proposed turnouts shall be labeled with stationing, frog type and size, manual or power operated, lead length (point of switch to one half point of frog) rail weight and if it right or left hand movement.

5.1.9 Existing and proposed track centerlines shall be identified with a common name so that they are clearly identified and distinguishable from the other tracks. The rail weight(s), locations of where rail weights change, type of construction (jointed or welded) and minimum track centers shall be noted.

5.1.10 Horizontal clearances to any obstruction within fifteen (15) feet of the centerline of the proposed track. The fourteen (14) foot clearance point, railroad property line and pertinent property corners shall be noted with description and stationing along with the length of storage capacity of each track.

5.1.11 Storage length shall be measured in "track feet" and number of cars per track as measured between the fourteen (14) foot clearance point or point of derail or end of track device.

5.1.12 Storage of rail cars is not permitted within a minimum of two hundred fifty (250) feet of the edge of an at grade road crossing. Adequate sight distance must be provided for approaching vehicles.

5.1.13 Utilities

5.1.13.1 Utilities entering upon railroad property or crossing underground or overhead are to be installed, protected, adjusted, removed or relocated pursuant to the OmniTRAX Utility Accommodation Policy.

5.1.13.2 Overhead wire-line crossings or those that may be constructed adjacent or parallel to the railroad alignment shall include station location and/or offset and include vertical clearance above top of rail and voltage of the line.

5.1.13.3 Underground utility lines should include location, type of line, depth below base of rail, proposed encasement details and commodity of pipe.

5.1.13.4 Any parallel lines (underground or overhead) in the vicinity of the existing or proposed track, especially FIBER OPTIC CABLES shall be located with offsets provided.

5.1.14 Drainage structures (type, size and length) existing and to be installed under tracks, roadways and facilities; including invert elevations of the inlet and outlets in relation to the top of rail. In addition, flow patterns should be shown in the vicinity of all tracks to indicate water control after construction, along with existing drainage devices in the vicinity. Plans, specifications and computations for proposed drainage structures and modifications involving OmniTRAX controlled property shall be submitted for review and approval.

5.1.15 Fences – label station and distance to all existing and proposed fencing in the vicinity of tracks with locations of gates crossing track noting clearance distance from centerline of track to near edge of gate or post when in the open position. .

5.1.16 Location by station and clearance to any rail car pulling device(s) existing or to be installed along with identifying all other types of rail car moving equipment to be used.

5.1.17 Road Crossings – label all existing and proposed centerline location stations of at grade or separated (over or under), public or private, existing and proposed length(s), type of road crossing surface and the type and location of warning devices to be installed. Each existing crossing should be identified by the AAR/DOT number and milepost location

5.1.18 Location of any under-track unloading structure along with two (2) sets of detailed professionally sealed structural plans which should include type of construction, placement and size of reinforcing steel in concrete, thickness of walls and floor, type and size of rail supporting beams (including weight per yard of the beams), weight of rail to be used over the structure and method of fastening the rail to the beams.

5.1.19 Location and details of any overhead loading devices, including side loading racks with drop platforms. Details should include size and location of supports, footings, position locking devices, overhead and horizontal clearance. Clearances from the centerline of track should be shown to indicate dimensions when the device is in use and also in the retracted position for train movement.

5.1.20 Details of any type of track support system other than the standard "rail on tie plates on wood ties on ballast construction" must be provided.

5.1.21 Property Lines – location of railroad or other than railroad property lines along with the associated widths, stationing at points where the centerline of track crosses the property line and distance and location where property was established.

5.1.22 Direction to and name of nearest Railroad city and any special or notable project issues, reference points such as unique geotechnical conditions or special property concerns.

5.1.23 Signs – all roadway and railroad signs shall be identified by type and location (station) or offset and may include division of

ownership, warning, advance warning, vehicle and track speed, grade crossing (whistle post) and railroad mileposts.

5.2 PROFILE

5.2.1 Top of rail of the proposed track to be identified every one hundred (100) feet including vertical curve lengths and points of vertical curves along with the associated stations.

5.2.2 Profile stationing shall be in the same direction as the proposed and existing track alignment and displayed on the same scale as the plan view.

5.2.3 Original surface below the proposed track centerline shall be shown for reference.

5.2.4 The average grade of the existing profile at the tie in locations or where a track raise is to end.

5.2.5 A top of rail profile is required at no more than fifty (50) foot intervals of any proposed road that is to cross the track(s).

5.2.6 Label all track elements with description, station and elevation including point of switch, derails, and end of track devices.

5.2.7 Top of rail of the existing track two hundred (200) feet in both directions from the proposed point of switch, this shall be the low rail in super elevated track.

5.2.8 Description and location of benchmark used in determining elevations.

5.2.9 All drainage structures and devices including inlet and outlet invert elevations should be shown on the profile referenced to the top of rail and located with a station.

5.2.10 Any underground crossings under the proposed track should be shown and referenced to the top of rail and station location.

5.3 MISCELLANEOUS

5.3.1 Typical cross section identifying rail, plates, cross ties, ballast depth, subballast depth, sub-grade, walkway and ditch details.

5.3.2 Cross section every one hundred (100) feet and at points of interest such as obstructions, clearance restrictions, drainage structures and

special track elements such as points of switches, derails and locations where embankment is to be widened to properly accommodate walkways.

5.3.3 Stationing of proposed track should begin with 0+00 at the proposed point of switch for each new track. As stationing is progressed along the lead (or main track) an equation shall be provided where each new switch is encountered.

5.3.4 Permanent Structures

5.3.4.1 All under track structures shall meet AREMA recommendations and designed to carry Cooper E-80 live load with diesel impact.

5.3.4.2 A complete set of construction and shop drawings sealed by a current registered licensed professional engineer licensed in the state the work is to be performed shall be submitted to the Vice President – Engineering for review and approval.

5.3.4.3 Any track constructed within twenty five (25) feet of an overhead bridge pier shall require a crash wall.

5.3.4.4 Excavations proposed adjacent to a track shall be properly shored pursuant to the latest AREMA recommendations for railroad loadings.

5.3.4.5 Design and construction of track scales shall be performed under the guidance of a licensed professional engineer familiar with and in accordance with the AREMA recommendations and the Association of American Railroads AAR Scale Handbook.

5.4 DRAFTING STANDARDS

5.4.1 Plans provided shall clearly define all existing and proposed conditions to allow for sound judgments to be made in the approval process.

5.4.2 Existing features that are not to be disturbed shall be shown in a light weight black solid lines. Various colors shall be used to show the proposed work including a heavy weight dashed line to signify centerline of proposed track.

5.4.3 A north arrow shall be correctly orientated with a graphic scale to be scalable using standard engineering measurements.

5.4.4 The plan shall be orientated so that north is to the top or right side of the drawing.

5.4.5 Proposed work items including new installations, removals and rehabilitations shall be clearly identified in a distinguish color with appropriate text describing the action being proposed.

5.4.6 A title block shall include name of the industry, date of plan preparation, status of plan (i.e. conceptual, preliminary, issued for construction), contact information of engineering firm who produced the drawing, location (near city, county, state), drawing title and drawing number or file reference.

5.4.7 All designs shall be submitted in both a PDF and AutoCAD versions for review by the Vice President - Engineering and if approved for integrating into the OmniTRAX GIS system map. Electronic files shall be submitted either by email or a compact disk.

5.4.8 PDF sheets shall be sized to print “as-is” on 11”x17” paper using the English (USA projects) decimal measurements with a maximum scale of 1”=100’ for a non-conceptual plan for ease of reproduction.

5.4.9 A legend shall be provided explaining all line types and symbols used.

5.4.10 The latitude and longitude coordinates are to be provided to assist in the review and verification process.

6. TRACK DESIGN

6.1 ALIGNMENT

6.1.1 Horizontal curves of 10° 00’ by Chord Definition (Radius = 573.69’) or less, are preferred. Curves greater than 10° 00’ must have approval of the Vice President - Engineering. (question the intention of this deletion). Horizontal curves for unit train facilities of 7° 30’ shall be utilized.

6.1.1.1 Horizontal curves shall not pass onto or through the limits of a turnout or switch point derail and shall not pass through an at-grade crossing surface where avoidable.

6.1.1.2 Calculations for horizontal curves must be based on the chord definition. This defines degree of curve as, the central angle subtended by a 100-foot chord.

6.1.1.3 Spiral curves and superelevation are not normally required on industry tracks but, if required by special circumstances, shall be designed according to current AREMA recommendations.

6.1.2 All horizontal clearances to fixed or movable obstructions shall meet the requirements set forth by the local state regulatory authority in which the project is being proposed but at a minimum shall be 8’-6” from the track centerline to the nearest obstruction. The horizontal clearance will be increased 1-1/2” per degree of curve where the obstruction is located adjacent to or within 80 feet of a turnout or curve limits.

6.1.2.1 In the event clearances cannot be provided warning signs shall be installed and must be illuminated at night.

6.1.3 A minimum tangent distance of at least one hundred (100) feet between reverse curves or facing point switches is required or between curves and points of switches. Mainline applications shall have a minimum of two hundred (200) feet; prefer three hundred (300) feet between points of curves and points of switches.

6.1.4 Vertical curves shall have a minimum length of 100’ and V/L is not to exceed 1.2 for Sags and 2.0 for Summits.

$$\frac{V}{L} = \frac{V\ (\text{Grade 1}) - V\ (\text{Grade 2})}{L\ (\text{Length of curve in stations})}$$

6.1.5 Proposed track grades shall be kept to a minimum not exceeding two (2) percent on lead tracks; three (3) percent on spur tracks; one half (0.5) percent on storage tracks and two tenths (0.2) percent on loading / unloading tracks.

6.1.5.1 Track grades for loading / unloading tracks should extend a minimum of thirty (30) feet or one half the length of a rail car whichever is greater from the first and last car spot to the point of vertical curve.

6.1.5.2 Grades must be carefully designed to ensure that motive power available will properly manage the tonnage to be moved taking into consideration number of either loaded or emptied cars and climate conditions (rain, snow and ice).

6.1.5.3 Frequent changes of grade are to be avoided and shall be consistent with the surrounding terrain constraints.

6.1.5.4 The grade from the point of switch through the long switch ties must be the same as the existing track that the turnout is coming out of.

6.1.6 Roadbed for private track within the Railroad right-of-way and parallel to a main or operating track shall be constructed a minimum of six (6) inches lower than that of the nearest main or operating track whenever drainage of the existing track could be affected by the new construction.

6.1.7 Track center minimums are as follows:
14’ minimum, 15’ preferred on tangent track
15’ if spur is adjacent to a lead track or on a curve track
20’ if spur is adjacent to a switching lead
25’ if spur is adjacent to a main or branch line track

6.2 TURNOUTS AND DERAILS

6.2.1 No. 11 turnouts are required in all main tracks and located not closer than 300’ to a main line curve or bridge. If a new turnout is located within 300’ of a bridge having no walkway, it is required that a walkway be installed on the bridge by customer. No. 10 turnouts may be considered as an alternative.

6.2.2 No. 9 turnouts are recommended for industry track installation(s), other than main track. No. 8 turnouts will be considered where site conditions warrant.

6.2.3 Proposed turnouts shall not be designed as a simple curve, but drawn based on the frog/turnout angle, length of complete turnout from point of switch to last long tie and point of intersection distance (actual lead minus (number of frog multiplied by 4.75). The PI length is location of the through track separates from the diverging track centerline at the design frog angle.

6.2.4 Turnouts and derails are to be placed outside of vertical curve limits.

6.2.5 All turnouts and derails to be surrounded by walkway ballast and should meet requirements of the State Public Commission, Railway Commission or other State and or Federal agencies policies adapted for the state in which the project is being proposed.

6.2.6 Two turnouts in the same track diverging in opposite directions shall be separated by one hundred (100) feet from point of switch to point of switch unless certain site constraints exist where seventy (70) feet may be considered.

6.2.7 Two turnouts in the same track diverging in the same direction will be separated by fourteen (14) feet from point of switch to point of switch

6.2.8 Turnouts in the mainline shall not be placed within one hundred (100) feet of an at-grade road crossing or a railroad bridge face of back-wall.

6.2.9 If a turnout is placed within five hundred (500) feet of a bridge that does not have a foot walk with handrail on both sides, then its installation will be required.

6.2.10 Derails shall be placed on all tracks connecting with a mainline, siding or industrial lead. The derail location and type shall be based on design gradient with respect to the track being protected and placed so that a car will derail away from and before it fouls, the track being protected.

6.2.10.1 Double switch point derail (DPSS) are required when a track descends towards the track being protected, when the industry moves cars within the industry or if operating conditions require positive derail protection. DPSS shall be placed on tangent track and shall have the end of the last long tie of the derail one hundred (100) feet from the fourteen (14) foot clear point when protecting

mainline track and fifty (50) foot when protecting non-mainline track.

6.2.10.2 A sliding derail with wheel crowder will be considered under certain site constraints and shall be placed fifty (50) feet beyond the fourteen (14) foot clear point.

6.2.10.3 A sliding derail can be installed where the proposed track has no grade, descends away from the track being protected, or has no portion of the track's elevation higher that the elevation of the derail and shall be placed fifty (50) feet beyond the fourteen (14) foot clear point.

6.2.11 All industry tracks handling hazard materials must include a double switch point derail.

6.2.12 All derails shall be equipped with a derail sign on the switch stand or post adjacent to the switch stand and surrounded by walkway ballast as may be dictated by local, State, or Federal regulations.

6.3 MISCELLENOUS

6.3.1 End of track device shall be placed at the open end of each stub ended track that may consist of either an earthen berm made of either embankment or subballast material or a suitable bumping post to be approved by the Vice President - Engineering.

6.3.1.1 Wheel stops will not be considered a suitable or effective end of track device.

7. ROADBED

7.1 Drainage

7.1.1 Thorough drainage is essential. Every effort must be made to keep the tracks, roadbed and walkways properly drained at all times.

7.1.2 All existing and proposed locations of track ditches across and/or parallel to the proposed track alignment shall be shown on the proposed plans. Profiles of these ditches should also be included on the proposed plans.

7.1.3 At track ditch intercepts, rip rap or other protection shall be provided to protect the roadbed if necessary, as directed by the Vice President - Engineering.

7.1.4 All drainage structures shall be approved by the Vice President - Engineering.

7.2 Width of roadbed

7.2.1 A minimum width of twelve (12) feet as measured from the centerline of the track is required. The roadbed will be crowned at the centerline with a two (2) percent slope in each direction. The width will vary for required walkways at turnouts and derails.

7.3 Slopes

7.3.1 Fills - 2:1 unless conditions warrant flatter slopes.

7.3.2 Cuts - Common material not less than 1-1/2: 1 recommend2:1

7.3.3 Sound rock - ¼: 1

7.4 Grading

7.4.1 Side Ditches – will have a flow line at least two (2) feet below finished subgrade. Minimum width of the ditch at the flow line shall be two (2) feet or more, as conditions warrant.

7.4.2 Stabilization of Embankment – pursuant to a geotechnical review of the soil tests of the embankment materials a portion of the subgrade may require stabilization utilizing cement, lime or fly ash. The minimum depth of subgrade stabilization shall be six (6) inches. Subgrade stabilization shall be compacted to not less than 95% of the maximum density, and to within +/- 2% of the

optimum moisture content, as determined by ASTM D 1557 (Modified Proctor Testing Procedures).

7.4.3 Compaction – Where subgrade stabilization is not required, compaction to not less than 95% of the maximum density, and to within +/- 2% of the optimum moisture content, as determined by ASTM D 1557 (Modified Proctor Testing Procedures).

8. TRACK MATERIAL

8.1 Rail

Under light to average rail traffic conditions, quality 112 lb. to 136 lb. relay rail is recommended. Other weights may be considered depending upon site conditions and type of traffic, but no rail less than 90 lb. rail will be approved. Relay rail must meet or exceed the limits specified in AREMA as Class 1 material.

8.2 Other Track Material

8.2.1 Joint Bars, new or quality secondhand, must match the rail section being used. Prefer six (6) hole joint bars be utilized where and when possible.

8.2.2 Double shoulder tie Plates, new or quality secondhand, properly sized for the rail being furnished not less than thirteen (13) inches in length are required. All cross ties and timbers will have tie plates properly placed. The rail seat area shall be cleaned of excess dirt and debris.

8.2.3 Track Bolts will be appropriately sized for the bolt holes in the rail section furnished with a sufficient length to allow a heavy duty washer and fully threaded nut on the bolt. The bolt, washer and nut will be new in accordance with AREMA recommended practice.

8.2.4 Track Spikes will be new 5/8" x 6" medium carbon spikes installed with a minimum of two per tie plate, one on each side against the base of the rail in opposite holes in the plate. Track spikes shall conform to AREMA recommended practices.

8.2.5 Rail Anchors will be new with every other cross tie or timber being box anchored. The exception will be at a rail joint, where no anchors will be installed on the ties opposite the joint. All switch ties will be completely box anchored except within the switch points. Box anchoring is defined as an anchor on each side of a tie on both rails. Anchors shall have a solid bearing against the side of the tie.

8.2.6 Compromise bars or compromise field welds will be utilized when rails of dissimilar rail sections are connected. The compromise bars will be of the proper size and type for the rail sections being joined. Turnouts will have the same rail sections used throughout the turnout including the stock rails, running rail, closure rail and

turnout components. No compromise joints will be allowed on switch ties. Compromise joint bars accommodating six (6) bolts shall be utilized when and where possible.

8.2.7 Insulated joints shall be of the proper size and type for the rail sections used. The entire surface of the rail covered by the insulated joint must be thoroughly cleaned of rust, scale and dirt.

8.3 Ties

New creosoted oak, mixed hardwood or Douglas fir 6" x 8" x 8'6" ties spaced at 20" center to center are recommended for light traffic conditions. New creosoted oak, mixed hardwood or Douglas fir 7" x 9" x 8'-6" ties spaced at 20" center to center are recommended for medium traffic conditions. New creosoted oak, mixed hardwood or Douglas fir 7" x 9" x 9' ties spaced at 20" center to center are recommended for heavy traffic conditions. The creosote treatment is to be a 50/50 mix of creosote and petroleum base.

Minimum absorption is to be 8 lbs. per cubic foot. Only new oak, mixed hardwood or Douglas fir creosoted switch ties will be used for the turnouts in the appropriate pattern. The use of concrete, steel or alternate ties are subject to approval of the Vice President - Engineering.

8.4 Ballast

Under light traffic, crushed rock AREMA Class 5 may be used. Under medium and heavy traffic, crushed rock ballast, main line quality, AREMA Class 4A will be used. The allowable wear based on the Los Angeles Abrasion Test will not be greater than 35%. Minimum depth will be 15" between the top of the finished sub-grade and top of tie. The full ballast section extends 12" beyond the ends of the tie and thence to sub-grade on not less than a 2:1 slope. Ballast used for walkways will be a graded material not to exceed 1" in diameter, AREMA Class 5.

TABLE 1

RECOMMENDED LIMITING VALUES OF TESTING FOR BALLAST MATERIAL

PROPERTY	Granite	Trap rock	Quartzite	Limestone	Domestic Limestone	Blast Furnace Slag	Steel Furnace Slag	ASTM Test
Percent Material Passing No. 200 Sieve	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	C 117
Bulk Specific Gravity (See Note #2)	2.6	2.6	2.6	2.6	2.6	2.3	2.9	C 127
Absorption Percent	1.0%	1.0%	1.0%	2.0%	2.0%	5.0%	2.0%	C 127
Clay Lumps Friable 5 Cycles	0.5%	0.5%	0.5%	0.5%	0.5%	0.0%	0.5%	C 142
Degradation	35.0%	25.0%	30.0%	35.0%	35.0%	40.0%	30.0%	See Note #1
Soundness (Sodium Sulfate)	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	C 88
Flat and/or Elongated Particles	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	USACE CRD-C 119

Note #1 – Materials having gradations containing particles retained on the 1" sieve shall be tested by ASTM C 535. Materials having gradations with 100% passing the 1" sieve shall be tested by ASTM C 131.

Note #2 – The limit for bulk specific gravity is a minimum value. Limits for the remainder of the tests are maximum values.

TABLE 2

RECOMMENDED BALLAST GRADATIONS

Percent Passing

Size No.	Nominal Size Square Opening	3"	2-1/2"	2"	1-1/2"	1"	¾"	½"	3/8"	No. 4	No. 8
4A	2"-3/4"		100	90-100	60-90	10-35	0-10		0-3		
4	1-1/2"-3/4"			100	90-100	20-55	0-15		0-5		
5	1"-3/8"				100	90-100	40-75	15-35	0-15	0-5	

Note #1 – Gradation Numbers 4A and 4 are main line ballast materials. Gradation Number 5 is yard ballast material and acceptable for use in walkways.

9. CLEARANCE REQUIREMENTS

9.1 Horizontal

The minimum clearance will be eight feet six inches (8'-6") from the centerline of track to the nearest obstruction. Horizontal clearances are to be increased one and one half (1-1/2) inches per degree of curve where the facility is located adjacent to or within eighty (80) feet of a turnout or horizontal curve.

9.2 Vertical

9.2.1 Minimum of twenty three and one half (23.5) feet from top of rail to nearest overhead obstruction.

9.2.2 Minimum of twenty seven (27) feet from top of rail to overhead wires to be adjusted for voltage as the National Electrical Code (NEC) requires

9.2.3 Depending upon the commodity carried a minimum of four (4) to ten (10) feet below base of rail of any track to the top of a utility or the casing for the utility.

9.3 All loading/unloading equipment that fouls the clearance envelope during operation must positively lock in a non-fouling position when not in use.

Note: In some instances, certain states may accept vertical or horizontal clearances slightly less than OmniTRAX standards. In these instances, OmniTRAX normally will accept the State's lesser clearance requirements, although the Industry will be required to sign an Impaired Clearance Agreement with the Railroad. In any instance, when either horizontal or vertical clearance is less than those of the State Railway or Public Service Commission, as the case may be, the industry shall secure necessary approval from the appropriate State Authority for each impaired clearance. The agreement covering service to the Industry's track will include specific reference to the substandard clearance involved. When State Law requires clearances that are more restrictive, such laws will govern. Required signs shall be placed in advance of the impaired clearance to advise railroad operating personnel on the impairment.

10. TRACK CONSTRUCTION SPECIFICATIONS

TRACK LAYING AND SURFACING

10.1 Track laying and surfacing shall be supervised by experienced personnel skilled in railroad track construction.

10.2 Ties shall be placed with the heartwood side down at right angles to the rail and centered with respect to the adjacent ones. Cross ties shall be centered with respect to the centerline of the track. Ties shall be uniformly spaced center to center of the tie.

10.3 Ties shall be handled in such a manner as to avoid breaking or bruising. Ties shall not be thrown from cars or trucks.

10.4 Tie tongs or other suitable devices shall be used for handling ties. Use of bars, chisels, forks, mauls, picks, shovels or sledges for replacement of ties beneath the rails will not be permitted.

10.5 The bottom of the rail, the tie plate and top wearing surface of the tie shall be cleaned before the rail is laid.

10.6 Tie plates shall be applied at the time the rail is laid to avoid unnecessary spiking. Plate shoulder shall bear against the outside base of the rail.

10.7 Rails shall be unloaded, stored or distributed along the roadbed in such a manner as to prevent damage.

10.8 Rails may be laid with a minimum of a twelve (12) foot staggered joint arrangement.

10.9 If a determination is made to stagger rail, then rails of miscellaneous lengths, less than thirty nine (39) feet, shall be used at suitable intervals for maintaining the proper stagger of joints on curves.

10.10 Rails less than fifteen (15) feet long shall not be used except for temporary closures.

10.11 Expansion shims of hardwood or fiber shall be used to control expansion.

The following table of thicknesses is prescribed for various ambient temperatures.

Rail Temperature	33’ Rail Opening	39’ Rail Opening	78’ Rail Opening
Below 25° F.	¼”	¼”	½”
25 to 50° F.	1/8”	3/8” every other joint	3/8”
51 to 75° F.	1/8” every other joint	1/8”	¼”
76 to 100° F.	1/8” every other joint	1/8” every other joint	1/8”
Above 100° F.	1/16”every other joint	1/16”every other joint	1/8” every other joint

10.12 Rails shall be laid to insure good alignment and the rail ends must be brought squarely together against the expansion shims and shall be bolted before spiking.

10.13 Rails shall be cut square and clean by means of rail saws. Proper diameter holes for complete bolting of cut rails shall be drilled. Under no circumstances shall new holes be drilled between two holes already drilled. Cutting of rails or drilling holes in cut rails by means of an acetylene or electric torch will not be permitted.

10.14 The appropriate number of bolts shall be applied according to the rail joint used. The nuts of all bolts shall alternate uniformly inside and outside of each joint. Each bolt shall be equipped with a spring washer of size required to fit the diameter of the bolts used.

10.15 The straight rail in the turnout shall be spiked first, the closure rail with the proper offset from the straight rail shall be set then the turnout rail will be gauged and spiked in position in its proper relation to the end of the ties. Curved track shall be spiked to gauge 4’ 8-1/2” with no allowance for increasing the gauge. Curves should have a minimum of one anchor spike on the field side of the rail (opposite the field gauge spike) if the plate will allow.

10.16 All ties shall be spiked with two line-holding spikes per tie plate. One line-holding spike shall be on the gauge side and one on the field side of each rail. The outside line-holding spikes on opposite rails shall be installed on the same side of the tie. The gauge spikes shall be installed on the opposite side of the tie.

10.17 A track gauge shall be used in conjunction with the spiking operations and track brought to 4’ 8-1/2”. Gauge shall be measured at right angle to the rails at a point five-eighths (5/8) inch below the top of rail.

10.18 Track spikes shall be started and driven vertically and square with the rail and must not be bent against the rail. Spikes shall have full bearing against the rail base. Spikes shall not be overdriven or driven against the end of a joint bar or in a joint bar hole/slot. Any spike driven within two (2) inches of the end of a joint bar shall be considered to be against the end of a joint bar.

10.19 The removal of spikes, once driven, shall be avoided whenever possible. If spikes are pulled, the holes shall be plugged with new creosote-treated tie plugs or approved alternate.

10.20 Ballast shall be spread and the track raised in a series of lifts to the required height as indicated by the tolerances. No single lift shall be higher than four (4) inches. In raising track, jacks or equipment shall be so regulated as to avoid bending of angle bars or straining of joints. Jacks shall be simultaneously used and properly spaced at not more than quarter points of the rail to avoid breaks or bends in the rail when the track is being raised. Both rails shall be raised simultaneously and to the proper cross level by utilizing automatic tampers or standard track level boards with each set of track raising jacks. Each tie shall be tamped from fifteen (15) inches inside the rail to the end of the tie. Tamping will not be permitted at the middle of the tie where ballast is to be left to settle on its own accord. Both ends of a tie shall be tamped simultaneously and tamping inside and outside the rail shall be done at the same time. Tamping is to be done with approved machines in such manner as to produce uniform compaction.

10.21 All ties that are pulled loose in the track raising operation shall be placed in their proper position, properly tie-plated, plugged and fully re-spiked before tamping. During each track raise, the track is to be tamped in such a manner that it will be uniform.

10.22 Turnouts shall be constructed of all new or quality secondhand rail and other track material. Unless otherwise approved by the Vice President - Engineering, all turnouts must be fabricated to AREMA Recommended Practices.

10.23 All turnouts to be installed in the mainline will require the placement of an embankment berm alongside the track to facilitate the assembly of the turnout, with little or no disruption to mainline traffic. After the turnout is assembled, a track window will be coordinated with the local road master to remove the trackage and install the turnout.

10.24 Road crossings on industry-owned trackage may be constructed with plank, plank and asphalt or entirely with asphalt, with two and one half (2-1/2) inch flangeways provided on the gauge side of each rail. Higher types of grade crossing surfaces are encouraged where vehicular traffic warrants. Private road crossings within Railroad owned trackage, as well as public streets, roads and highways, will require plank and asphalt material as a minimum. Timber crossing materials shall be eight inches wide, square-edged and sound creosoted treated oak or mixed hardwoods, fir, hemlock, or equal, with the height of the plank equal to the distance from the top of the tie to the top of the rail. The planks are to be fastened with countersunk ¾" x 12" galvanized dome head drive spikes or equivalent. Each crossing location will be evaluated individually by the Railroad to determine crossing surface material requirements. No rail joints are permitted within the confines of the crossing including the road shoulders.

10.25 End of track devices will be approved by the Vice President - Engineering. Devices such as earth and tie bumper, wheel stops, or bumping posts such as Hayes heavy-duty post may be used. All bumping posts or stops shall be sized for the rail section being used in track. Consideration should be given to allow adequate space between the last car spot and the bumping post to allow the car to be coupled into without striking the bumping post.

10.26 Derails shall be Hayes, or equivalent type, appropriately sized for the designated rail section, or a double split switch point derail complete with proper length connecting rod and operating stand with target. Type to be used will be determined by the Vice President – Engineering and be dependent on track gradient and location. Hayes derails to be placed a minimum of 50’ beyond the 14’ clearance point. Switch point derails to be placed a minimum of 80’ beyond the 14’ clearance point. Walkways must be installed around all derail switch stands.

11. DRAINAGE STRUCTURES

11.1 Culvert pipes – Use of either ASTM C-76 Class V reinforced wall B concrete or coated corrugated steel pipe in an appropriate gauge thickness is acceptable.

11.2 Installation and use of polymer coated corrugated steel pipe culverts shall be in accordance with AREMA recommended practices and approved by the Vice President - Engineering. Connecting bands shall be twenty four (24) inches in length and of the same type and gauge of material as the pipe furnished.

11.3 Minimum size shall be not less than 24" diameter. In no case will the hydraulic capacity of a drainage structure under the railroad be reduced or will the ponding of water on the railroad property be permitted.

11.4 All culvert pipe used shall provide for Cooper E-80 design live load with diesel impact.

11.5 Depth from top of subgrade to top of culvert shall be one-half the diameter of the pipe or 24", whichever is greater.

11.6 All pipes shall contain camber when installed and be properly bedded as detailed in the department of transportation's specifications for the roadbed construction.

11.7 All reinforced concrete structure designs must be approved by the Vice President - Engineering prior to construction, i.e., concrete box culverts, bridges, under track pits, scale pits, etc.

11.8 All drainage structures shall have erosion protection around the structure openings through practices approved by the Vice President - Engineering.

11.9 High density polyethylene pipes will not be permitted for use under tracks that the railroad is to operate across.

12. SUB-BALLAST

12.1 Description

Sub-ballast shall consist of a crushed aggregate foundation course for a typical railroad roadbed and shall be composed of caliche, argillaceous limestone, conglomerate, gravel, crushed slag, or other granular materials.

12.2 Material Requirements

The materials shall meet the requirements hereinafter specified. Aggregate retained on a No. 10 sieve shall consist of hard, durable particles or fragments of stone, gravel, sand or slag. Materials that break up when alternately frozen and thawed or soaked and dried shall not be used. Allowable wear, based on the Los Angeles Abrasion Test, shall not be greater than 50%. A higher or lower percentage of wear may be specified by the Vice President - Engineering.

12.3 Gradations

It is the intent of this specification that the sub-ballast shall consist of gradations set forth in the following table:

Sieve Size	2”	1”	¾”	No. 10	No. 40	No. 200
% Passing (Optimum)	100	95	67	38	21	7
% Passing (Permissible)	100	90-100	50-84	26-50	12-30	0-10

12.4 Design Requirements

A MINIMUM OF EIGHT (8) INCHES OF SUB-BALLAST IS REQUIRED UNLESS A GEOTECHNICAL ANALYSIS REQUIRES A GREATER DEPTH

12.5 Construction Methods

12.5.1 Preparation of Sub-Grade

The roadbed shall be shaped in conformity with the typical sections shown on plans and to the line and grades approved by the Vice President - Engineering. All unstable or otherwise objectionable materials shall be removed from the sub-grade and replaced with approved material. The sub-grade shall be in an acceptable condition to receive the sub-ballast material.

12.5.2 Lift Thickness

The sub-ballast shall be constructed in two or more lifts of approximately equal thickness. The maximum compacted thickness of any one lift shall

not exceed six (6) inches and shall be compacted to not less than 95% of the maximum density and to within ±2% of the optimum moisture content, as determined by ASTM D 1557.

12.5.3 Compaction

If the material is laid and compacted in more than one lift, the Contractor shall plan and coordinate his work in such a manner that the previously placed and compacted lifts be allowed ample time for curing and development of sufficient stability before vehicles hauling materials for the succeeding lifts, or other heavy equipment, are permitted on the sub-ballast. Prior to placing the succeeding lifts of material, the surface of the lower lift shall be sufficiently moist to insure a strong bond between the lifts. The edges and/or slopes of the sub-ballast shall be bladed or otherwise dressed to conform to the lines, grades and dimensions shown on the plans.

13. WALKWAYS

13.1 Safety

Walkways shall be constructed and maintained to provide a reasonable regular surface and shall be maintained in a safe condition clear of vegetation, debris, standing water and other obstructions which constitute a hazard.

13.2 Grades and Slopes

Walkways shall not have a grade or slope in excess of approximately one (1) inch of elevation per eight (8) inches of horizontal length in any direction. Excess slope is permissible where the proximity of adjacent tracks so dictates, so long as the slope between tracks is constant.

13.3 Construction

For Standard Walkway Plan, Attachment B. Walkways shall be constructed to a minimum of eight and one half (8'-6") feet, as measured from the centerline of the track. It shall be constructed and maintained in such a manner that the elevation of its surface is at least level with the top of the ties.

13.4 Requirements

Walkways shall be located along both sides of tracks for a minimum distance of one hundred fifty (150) feet on each side of every switch stand or other track-side throwing mechanism. Walkways are required around all derail switch stands in accordance with the Standard Walkway Plan.

13.5 Minimum Distances

Walkways shall be continuous and maintained from the switch stand through the switch frog and along the diverging tracks to a point at least twenty five (25) feet beyond the clearance point of the switch. An additional three (3) feet of walkway width shall extend for a minimum distance of four (4) feet in each direction from the switch stand or other track-side throwing mechanism on the side of the track where said mechanism is located. The additional three (3) feet of width shall be gradually tapered back to the six (6) foot minimum width in a distance of not less than twenty (20) feet.

13.6 Guidelines

These specifications are provided as a guideline for design and should not be taken as authority to construct walkways. All walkway construction must conform to the OmniTRAX Specifications or the federal, state or local specifications, whichever is the most protective from the standpoint of safety. All

walkway construction shall comply with current and applicable federal, state and local laws. Contractors shall be responsible for the proper construction of walkways in the state where tracks will be installed.

14. ROAD CROSSINGS

14.1 Vehicular warning signs to be placed pursuant to the Manual on Uniform Traffic Control Devices (MUTCD) latest edition.

14.2 Travel ways approaching at-grade crossing surfaces shall meet AREMA and AASHTO standards for grade changes.

14.3 Horizontal Alignment – Where practical, the highway should intersect the track at a right angle with no nearby intersections or driveways. This layout will enhance the vehicle driver's and locomotive engineer's view of the crossing area, reduces conflicting vehicular movements from crossroads and driveways, and is preferred for two wheeled vehicles. Attempts shall be made to located vehicle at grade crossings along tangent track alignments, not in railroad or highway curves.

14.4 Vertical Alignment – It is desirable from the standpoint of sight distances, rideability, braking and acceleration distances that the crossing be made as level as practical.

14.5 Vertical curves should be of sufficient length to ensure an adequate view of the crossing. In some instances, the roadway vertical alignment may not meet acceptable geometrics for a given design speed because of restrictive topography or limitations of right-of-way. If practical, the crossing surface should be on the same plane as the top of rail for a distance of five (5) feet either side of the centerline of the track. The surface of the highway should also not be more than three (3) inches higher or lower than the top of the nearest rail at a point thirty (30) feet from the centerline of the track unless superelevation makes a different level appropriate. Tracks that are super elevated or a roadway approach that is not level require site specific analysis.

14.6 It is the responsibility of the industry to incorporate any local, State, or Federal regulations, guidelines, or mandates which may govern grade crossing design at their proposed location.

14.7 Grade crossing warning devices may upgraded when working through an at grade vehicular grade crossing.

APPENDICES

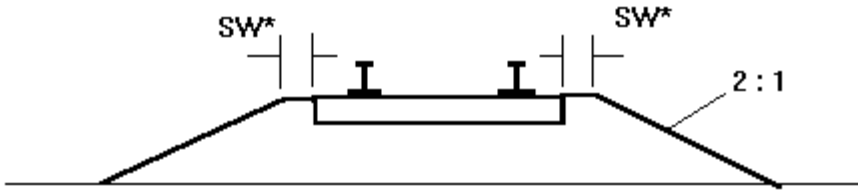
Attachment A

OmniTRAX

STANDARD BALLAST SECTION

JOINTED OR WELDED RAIL

No Scale



SW* is SHOULDER WIDTH which is the ballast width from the end of the tie to the edge of the slope.

	Welded	Jointed
SW Tangent	**12 “**	**12 “**
SW Curve	**12 “**	**12 “**

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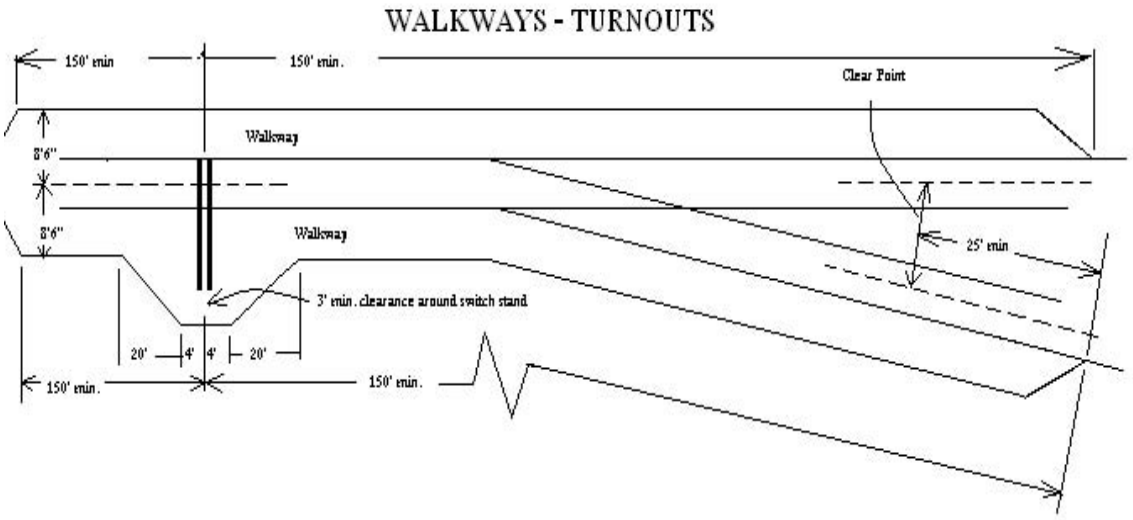
Attachment B

OmniTRAX



OMNITRAX

Turnout Walkway Standard

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